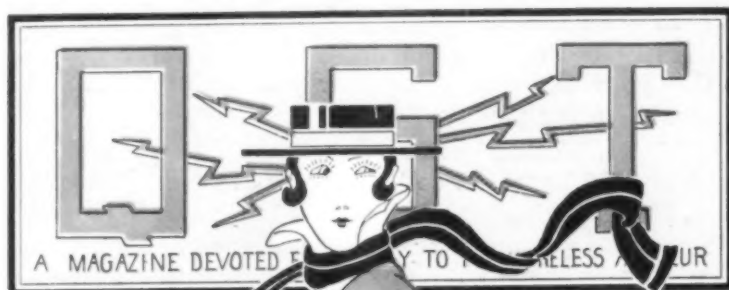


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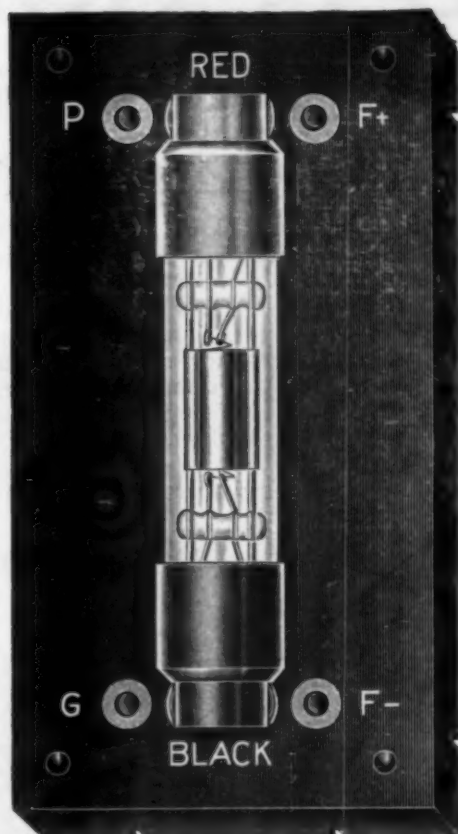
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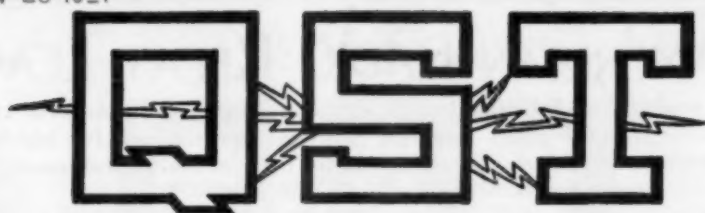
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# The Official Organ of the A.R.R.L.

VOLUME V.

NOVEMBER, 1921

No. 4

The Protection of Near-by Wiring Against Troubles	
Caused by Spark Transmitters	7
QRV for the Transatlantics?	10
Brew Your Own	<i>Robert Hertzberg</i> 12
Increasing the Tuning Range of Regenerators	<i>McMurdo Silver</i> 13
Station Reports	14
Some Operating Notes on the Larger Sizes of Transmitting Tubes	<i>W. C. White</i> 15
New Apparatus	19
Short Wave H.F. Amplification	22
Simple Modulation	<i>C. F. Butcher</i> 23
First Aid by Radio	<i>R. W. Goddard</i> 23
Theory of Freak Transmission	<i>J. V. Pursell</i> 24
Improving the C.W. Ground System	<i>H. H. Beverage</i> 25
Editorials	27
The Operating Department	29
With the Affiliated Clubs	42
"Strays"	46
Calls Heard	48
Radio Communications by the Amateurs	54
Classified Advertisements	132
Index of Advertisers	135

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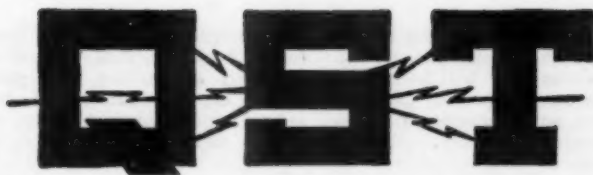
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A Magazine Devoted Exclusively to the Radio Amateur

## *The Protection of Near-by Wiring Against Troubles Caused by Spark Transmitters*

**A**MATEURS in various parts of the country often get into embarrassing difficulty from voltages built up in neighboring wiring by their spark transmitters, with resultant blown fuses, damaged fixtures, blinking lights, ringing bells, discommoded telephone service, etc. The trouble is not alone one of surges, as all wiring near the station is liable to trouble. Often it's the next-door neighbor or several neighbors who are inconvenienced, and several of our good stations have had to close down or reduce power to a small value to prevent a display of fireworks every time they opened up. And in addition to all this embarrassment, such displays cannot be caused without the consumption of energy and their very existence shows that some of our precious thousand watts is going elsewhere than as useful radiation.

This difficulty has bothered us entirely too long, so with a view to solving it it was referred to our A.R.R.L. Advisory Technical Committee. For assistance in this matter we are indebted to Messrs. Godley, Dellinger, Mathews, Kruse, Hazeltine, Ballantine, Ballard and Clausung, from whose reports the following data are presented.

As a major point, trouble of this nature can be divided into two classes, which may exist independently or in combination: (1) that caused by a direct conveying of troublesome voltages over the wiring supplying the radio transmitter, to nearby wiring, a phenomenon of course confined to the power circuits, which, however, are the most frequent scene of trouble; (2) that caused by induction into nearby wiring of every description because of its location within the strong field of the transmitting aerial. We will treat these two divisions in turn.

### **Trouble by Conduction**

This source of trouble includes not only surges or kick-backs, but conditions where by a continuous radio-frequency voltage is

induced in the power wiring by its proximity to the r.f. circuits. It is probable that trouble from either cause occurs most frequently when the power circuits of the building or of nearby buildings become resonant to the radio frequency by the cutting in or out of additional circuits, etc.

The remedy is (a) to separate the power-circuit and the r.f. circuit, and (b) to provide means for draining off or preventing such voltages as still exist. Considering these in order:

(a) Supply wiring should at no time be permitted to come within three feet of wiring carrying r.f. power. First off, that means that the transformer should be placed at least three feet from the closed circuit. Many amateurs are under the mistaken impression that the leads from the transformer secondary to the condenser (or gap, as the case may be) must be short. These leads carry only the supply frequency and there is no reason why they should be short—they do not effect the tuning. Radio-frequency chokes should be placed in these leads to keep the r.f. out of the transformer. A small wire is sufficient for such windings but the insulation must be excellent as often the full voltage of the transformer is imposed upon it. The primary power leads must not pass thru a blade on the antenna switch. While permissible on commercial quenched sets, the low tones and high voltages of amateur work make it dangerous, heavy voltages being thereby induced in the power wiring even if there are no direct flash-overs. All power wiring should be kept three feet from the radio circuits.

(b) The foregoing initial precautions having been observed, it is still necessary to provide some method of draining r.f. voltages from the power wiring. A protective device recommended by the national underwriters should be installed for this purpose, or one may be made by bridging two paper condensers in series across the line, with the center point between the two

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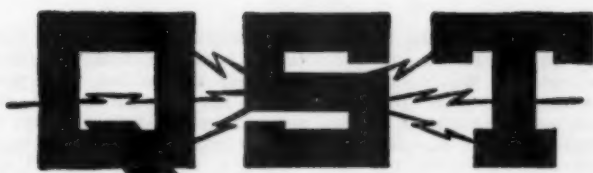
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A Magazine Devoted Exclusively to the Radio Amateur

## *The Protection of Near-by Wiring Against Troubles Caused by Spark Transmitters*

**A**MATEURS in various parts of the country often get into embarrassing difficulty from voltages built up in neighboring wiring by their spark transmitters, with resultant blown fuses, damaged fixtures, blinking lights, ringing bells, discommoded telephone service, etc. The trouble is not alone one of surges, as all wiring near the station is liable to trouble. Often it's the next-door neighbor or several neighbors who are inconvenienced, and several of our good stations have had to close down or reduce power to a small value to prevent a display of fireworks every time they opened up. And in addition to all this embarrassment, such displays cannot be caused without the consumption of energy and their very existence shows that some of our precious thousand watts is going elsewhere than as useful radiation.

This difficulty has bothered us entirely too long, so with a view to solving it it was referred to our A.R.R.L. Advisory Technical Committee. For assistance in this matter we are indebted to Messrs. Godley, Dellinger, Mathews, Kruse, Hazeltine, Ballantine, Ballard and Clausen, from whose reports the following data are presented.

As a major point, trouble of this nature can be divided into two classes, which may exist independently or in combination: (1) that caused by a direct conveying of troublesome voltages over the wiring supplying the radio transmitter, to nearby wiring, a phenomenon of course confined to the power circuits, which, however, are the most frequent scene of trouble; (2) that caused by induction into nearby wiring of every description because of its location within the strong field of the transmitting aerial. We will treat these two divisions in turn.

### **Trouble by Conduction**

This source of trouble includes not only surges or kick-backs, but conditions where-by a continuous radio-frequency voltage is

induced in the power wiring by its proximity to the r.f. circuits. It is probable that trouble from either cause occurs most frequently when the power circuits of the building or of nearby buildings become resonant to the radio frequency by the cutting in or out of additional circuits, etc.

The remedy is (a) to separate the power-circuit and the r.f. circuit, and (b) to provide means for draining off or preventing such voltages as still exist. Considering these in order:

(a) Supply wiring should at no time be permitted to come within three feet of wiring carrying r.f. power. First off, that means that the transformer should be placed at least three feet from the closed circuit. Many amateurs are under the mistaken impression that the leads from the transformer secondary to the condenser (or gap, as the case may be) must be short. These leads carry only the supply frequency and there is no reason why they should be short—they do not effect the tuning. Radio-frequency chokes should be placed in these leads to keep the r.f. out of the transformer. A small wire is sufficient for such windings but the insulation must be excellent as often the full voltage of the transformer is imposed upon it. The primary power leads must not pass thru a blade on the antenna switch. While permissible on commercial quenched sets, the low tones and high voltages of amateur work make it dangerous, heavy voltages being thereby induced in the power wiring even if there are no direct flash-overs. All power wiring should be kept three feet from the radio circuits.

(b) The foregoing initial precautions having been observed, it is still necessary to provide some method of draining r.f. voltages from the power wiring. A protective device recommended by the national underwriters should be installed for this purpose, or one may be made by bridging two paper condensers in series across the line, with the center point between the two

grounded. It may sometimes also be found a help to insert r.f. chokes in the power lines, altho in most cases they will be superfluous. These ideas are shown in Fig. 1. The Committee does not recommend fuses in series with a condenser drain. Resistance rods have proved unsatisfactory, as to obtain protection they have to be of such low value as to consume considerable energy. Electrolytic arresters are OK if continually looked after, but their maintenance is quite bothersome. Condensers are considered most satisfactory. It is important that the ground lead of the protective device be separate from the transmitter ground and that the two ground leads be neither parallel nor close together, or it may cause more trouble than would occur without it.

A lamp burning on the circuit will often furnish sufficient "leak" to prevent the building up of voltages, and as an additional precaution a single 32 c.p. carbon-filament lamp may be bridged across the line.

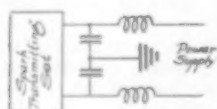


FIG 1

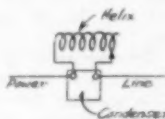


FIG 2

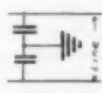


FIG 3

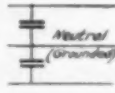


FIG 4

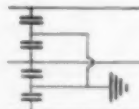


FIG 5

In persistent cases of surges, and where the trouble is known to be caused by propagation from the transmitter power wiring to adjacent wiring, the phenomenon of parallel resonance may be utilized to choke off the r.f. kick-backs. A condenser and inductance in parallel, tuned to the frequency of the transmitter, are inserted in the power line, as shown in Fig. 2. Such a combination offers infinite impedance to the series flow of frequencies of its own value. It may consist of a helix 8" diameter, of about 15 turns of No. 8 bare wire, adjustable, with a glass-and-foil condenser of about .0003 mfd., the combination capable of being tuned to the wave length used by the transmitter. To obtain the maximum reduction it will be necessary to consider the location of the r.f. nodes and loops in the power line and the best location of the device can only be determined by trial. Best adjustment is had when resonance is obtained using relatively large values of inductance and small values of capacity.

The running of the station wiring in grounded metal conduit is also recommended, to shield it from induction from transmitter circuits.

#### Trouble by Induction

Most of the foregoing suggestions have long been recognized as good station practice and are the first things one does when trouble is experienced, if they have

been neglected before. Not a few amateurs, however, find that this has no effect on their difficulties, and pyrotechnics continue in the houses of neighbors often several hundred feet away, etc. When this is the case the trouble is by induction—voltages occur in the adjacent wiring by direct induction from the antenna system. To determine which is the cause of the trouble, disconnect the antenna and excite the transmitter. If the trouble ceases it is evident that it is caused by the field of the antenna, while if it continues it is evident that it is owing to propagation over the wiring as covered hereinbefore.

Being an induction phenomenon, it will be understood that disturbances are greatest when resonance accidentally occurs in the wiring, the induced voltage varying roughly as the inverse of the distance, or, where no resonance occurs, as the length of wire exposed to the field. It is probable, however, because of the considerable distances that often intervene between the aerial and the scene of trouble, that this

effect occurs only at or near resonance or at some harmonic of the resonant frequency. In other words, if the inductances and capacities of certain nearby wiring systems are such as to result in resonance with the wave length of the transmitter, trouble is quite likely to result, and telephone circuits, bell lines, etc., are just as susceptible as power wiring. This explains why trouble sometimes develops at a considerable distance while nearer wiring systems are unaffected.

If the transmitting wave length could be changed the trouble might conceivably disappear, altho likely to show up at some other point, but generally it is impossible or inadvisable to shift the wave length. It should be said, however, that a poor decrement in the aerial circuit is a most prolific source of trouble, and stations with good ground systems are generally free from such difficulty. Likewise, an improperly adjusted rotary gap, with electrodes spaced too far or with teeth improperly spaced, will cause extraordinary potentials in the aerial circuit which of course increase the likelihood of induction troubles. These voltages can puncture condensers and in general disable telephone lines and, in the case of lighting circuits, generally cause a spark in a fixture; whereupon, a spark being a conductor, the 110 volt supply follows in an arc, shorting the line inside the fixture, melting sockets, blowing fuses, etc.



The remedy for such potentials is obvious: (a) drain them off the lines; (b) detune the circuits to get them out of resonance with the radio frequency. Considering these in order:

(a) Resistances and electrolytic arresters are not to be recommended for reasons described, but a simple arrangement of a pair of condensers in series, with the center point connected to an independent ground, will generally suffice. See Fig. 3. Loops and nodes of potential will be found along a troubled circuit and, while the value of capacity is not of much importance, .005 mfd. to 0.5 mfd. being recommended, the dielectric strength will have to be governed by the intensity of the effect encountered. In some cases ordinary paraffined paper condensers will do; in others it may be necessary to use old glass plate transmitting condensers. When high voltages are experienced, a protective device known as a vacuum tube arrester, made by the General Electric Co., may be used. They consist of a 3/64" gap between a disc and the inner wall of an exhausted metal tube, the breakdown voltage being from about 300 to 550 D.C., 200 to 400 A.C. They are used the same as the condensers in Fig. 3, two in series across a circuit with the center connection grounded: or, in the case of a three-wire supply, either condensers or V.T. arresters may be bridged across each side of the line without ground connection (the neutral point on the pole transformer being grounded) as shown in Fig. 4. Or, where the neutral cannot be grounded or there is likelihood that one of the outside wires instead is grounded, as sometimes occurs, a drain with center ground may be connected across each side of the line, as in Fig. 5. It is better to have the neutral grounded, however.

If V.T. arresters are employed they should be used with heavy line fuses as at times the power arc follows the spark when they break down. A low resistance in series with each arrester will help to overcome this.

*Such drains (Fig. 3) should be installed wherever trouble develops. The most logical place is at the service entrance of the affected house, with additional ones for each individual point of trouble.*

In general, buildings with metal roofs or having wiring in conduit are less likely to develop trouble, but sometimes it may occur where the exterior wiring runs closer to the antenna. Wherever the power company can be induced to move wiring, then, trouble may be minimized without resort to other methods. The induction is a static phenomenon, however, and merely shifting the wiring to right angles with the antenna will not help appreciably—it must be moved farther away, or shielded in some way.

In the case of telephone lines such large

drains cannot be employed without interfering with the service. Generally the lightning arrester supplied by the company will take care of trouble if it is properly maintained but if the induced potentials are too great it is not sufficient. A method that has helped in such trouble is as follows: The usual telephone conductor is replaced by a three-wire twisted cable, one end of the extra wire being grounded. This drains the potential without interfering with the service. Another method consists of running both lead wires thru a small insulated tube around which is wound a coil of magnet wire, one end of same being grounded. Suggestions for detuning telephone lines will be found in the following section of this article. Practical experiments looking to a further solution of this trouble are now being conducted at an A.R.R.L. station and results will be announced as soon as completed.

(b) A plan that has been used successfully in many troublesome cases lies in the individual treatment of the troubled circuits and comprises the use of either inductances or capacity for detuning the troubled circuit, or the use of resistance in such a way as to render the circuit non-oscillatory; and, in severe cases, detuning of the circuit and the use of resistance in conjunction.

If it is a bell circuit, ground at the batteries (usually in the basement) and, if this does not seem effective, insert an air-core inductance of 30 or 40 turns of bell wire 3 or 4 inches diameter in the ground lead.

If it is the telephone, try inserting a similar amount of inductance in each side of the line near the fuse block; or ground each side of the line thru a paper or mica condenser having a value *not to exceed* 0.005 mfd.; or ground each side of the line thru a carbon rod resistance of the order of 5000 ohms.

If it is the lighting circuit, ascertain which side of the circuit is normally grounded, and ground the ungrounded side thru a condenser of about .005 mfd. capacity, or thru a resistance of about 5000 ohms; or ground both sides thru condenser or resistance; or ascertain the size of wire of which the circuit is composed and insert an aircore inductance comprised of 30 or 40 turns of the wire 4 or 5 inches in diameter in one or both sides of the line. A little experimenting will determine the best method to use for detuning.

One member of the committee suggests that when all remedies have failed, a change to C.W. transmission will completely stop the trouble. (Groans from 9LC and 9ZN!) Seriously speaking, however, it is a fact, as the voltages in the antenna and other circuits for equal power will be reduced to less than a tenth of those experienced in spark operation.

## QRV for the Transatlantics?

It has been a long time since our always-enthusiastic membership showed such super-enthusiasm as has greeted the preparations for the Transatlantic Tests, particularly since the announcement of the sending of Mr. Godley to England to listen for our signals in addition to the several hundred British amateurs who form the main receiving network.

### The Preliminaries

Seventy-eight entrants from all over the U.S. and Canada were received for the Preliminary Tests, which will be held Nov. 1 to Nov. 6 as announced in last QST. A schedule has been prepared allotting each station a period for transmission in these preliminaries, and copies of the schedules have been distributed thruout the country by our Operating Department with special requests for the co-operation of certain listening stations, inasmuch as there was not time to broadcast the data thru QST. The stations meeting the preliminary requirements will be given individual places in the second section of each night's tests in December, as explained in October QST, and the final schedule placed in Mr. Godley's hands before he sails on Nov. 15th.

### Procedure

Everybody, including you, O.M., is invited to participate in the free-for-all section of each night's schedule, as printed on page 30 of October QST. Notice when your district is scheduled and be sure not to overstep your period.

The procedure shall take the form of a call addressed to "Test", calling three times and signing three times, repeating this as often as desired during the periods assigned for your district. For example:

"TEST TEST TEST de 6ZX 6ZX 6ZX", repeated.

The call letters of course are the important thing, and Mr. Godley and his witnesses will keep a continuous watch for them thru every one of the ten nights.

### British Prizes Offered

We have the honor of announcing for Messrs. Burnham & Co., well-known English apparatus manufacturers, that one of their "Burndept III Ultra" receivers will be given by them to the A.R.R.L. member

whose signals rank first in the reception in the British Isles.

This is a beautiful set, of which we unfortunately have no illustration clear enough to reproduce. It has three valves, radio-frequency amplifier, detector and audio amplifier, with switches for full control and the securing of various combinations, designed to cover 150 to 24,000 meters by the use of honeycomb coils. British apparatus is favorably known for the excellence of its construction and we will envy the winner of this set, which, without valves or coils, is priced at £25.

Mr. W. W. Burnham of this company is one of England's leading amateurs and assures us that they are going to make great efforts to receive the signals this time. More power to you, brother!



### MUU Reports

On each night of the tests a report of the results experienced by Mr. Godley will be transmitted by the station of the British Marconi company at Carnarvon, MUU. This will be in the form of a paid message addressed to the A.R.R.L. at Hartford, Conn., but the Marconi authorities, much interested in our tests, have kindly agreed to take it off their

hook at exactly 7 A.M. (their time) and send it slowly by hand in order that we amateurs may copy it direct and get the promptest possible news on who is getting across.

This 7 A.M. British time represents 2 A.M. Eastern Standard Time, 1 A.M. Central Time, 12 midnight Rocky Mountain Time, and 11 P.M. Pacific Time.

Now we all want to rig up long wave sets and get this dope, fellows, as it will enable every one of us to get the news at the earliest possible moment and much sooner than any broadcasting system of our own could get it around. It is a simple matter to get these signals, and so we appealed to Mr. A. L. Groves, author of the series of valuable articles on long wave reception appearing in QST the past two years, for his very best recommendations for their reception, and his very kind response enables us to conclude this article by presenting some reliable information on



## The Reception of MUU

By A. L. Groves

The reception of MUU unfortunately is no easy matter for amateurs residing within a couple hundred miles of the high power stations NSS, WGG and WII, especially if they are not used to copying long waves. The wave of NSS is 16,900 m. and that of WGG 16,100, and at short distance they heterodyne each other to such an extent that copying weak signals within three or four thousand meters of these waves becomes very difficult to the inexperienced. WII uses 13,600 m., which at close distances also intermingles with the waves of NSS and WGG.

MUU's wave length is about 14,200 m., from which it will be seen that some fairly close tuning must be done to receive him with success if all three of the above stations are working. The best and simplest way of receiving it is with the honeycomb coils, and taking WII as a guide MUU will be located just a few degrees on the secondary condenser scale above where WII comes in loudest.

With Duo-Lateral coil 1500 in the secondary, shunted by a 43-plate (.001 mfd.) condenser, WII tunes in at about 50 degrees on the 180 degree scale, and MUU should tune in at not over 53 degrees. With DL-1250 in the secondary, shunted by same condenser as above, WII tunes in at about 79 or 80 degrees and MUU at 83 to 85 degrees. The greatest selectivity, however, is obtained by using DL-1000 in secondary, and with this coil shunted by the 43-plate condenser WII should tune in at about 135 or 136 degrees while MUU will tune in about 142 to 144 degrees.

Whatever coil is used in the secondary, DL-750 should be used in the plate. No condenser is required to shunt this coil.

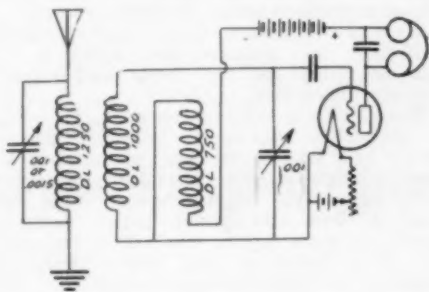
For all small aerials with a fundamental under 200 meters, DL-1250 is the correct coil for the primary and this should be shunted by a .001 mfd. or preferably a .0015 mfd. variable. For aerials from about 200 m. natural wave length up to around 250 or 260, DL-1000 should be used for the primary, shunted by a .001 or .0015 mfd. condenser. For larger aerials, smaller primary coils are used. An aerial with a natural wave length of about 1000 meters will require DL-500 in the primary.

To build a temporary set especially to receive MUU I would recommend the "rod" type of mounting with wooden "centers" for the coils as this is very cheap and efficient where it will not be necessary to change coils. Unmounted coils are suitable for use with this type of mounting and somewhat cheaper than the mounted ones. Three coils, the DL-750, DL-1000 and DL-1250, costing about \$8.65, are what most amateurs will need. If DL-1250 is too large for your primary you can use it in

the secondary and employ DL-1000 in the primary. The diagram herewith shows method of connecting, and position of the coils on the rod.

The filament and B battery are of course adjusted in the usual manner; then the secondary condenser is adjusted to approximately the figures above indicated. The plate coil is gradually brought closer to the secondary until the tube oscillates—which is indicated by a "thud" in the phones. With the primary coil about 2 to 2½ inches from the secondary, slowly vary the primary condenser until the set is "balanced out". After signals are picked up they can be brought in clearer and stronger by further adjustment of primary coupling, accompanied by slight changes in primary condenser. After that a slow loosening of the plate coupling will almost always give additional amplification.

The best method for the inexperienced is to practice a few minutes on WII and then



move up to MUU. Most of the time MUU can be heard weakly when tuned direct to WII and it is then only a matter of moving the secondary condenser up a few degrees and then barely move the primary condenser, and presto!—there is MUU. With DL-1000 in the secondary it is no trouble to tune out WII completely while on MUU, but to those unfamiliar with long wave work it will seem impossible at first.

Most of the common tubes will work well on the long waves, altho less B battery should be used and a much dimmer filament may be used, than on amateur waves. The steadiest work and perhaps the best is accomplished by using an amplifier tube on the long waves in place of the regular detector but for a temporary set it is doubtful if the difference would warrant the purchase of a special tube if one is not already on hand. Amplification is not recommended for copying MUU. His signals are strong enough for anyone to copy, as a rule, and amplifiers on long waves only serve to increase static and tuning difficulties.

## Brew Your Own

By Robert Hertzberg, 2ABK

**Y**'KNOW, it's funny what a little radio fone concert can lead to. At first I didn't believe a concert could ever lead to anything but the development of a choice vocabulary of cuss words pertaining to the efforts of some of the fone owners to render otherwise beautiful vocal selections with their own excellent (?) voices.

Well, to snap into it, there were three of us at 2AQQ's place one night: 2AQQ, Joe, and yours truly. 2XK was just beginning a vocal execution (appropriate word!) of that famous tear-bringer "How Dry I Am", when 2AQQ's father came in. He is one of those kindly old souls with a big heart and a bigger cellar. Noting the unusual silence of the radio room, he asked what the matter was, and for an answer his son handed him the extra pair of fones and told him to listen to the pathetic wailing. He listened and after a few moments took off the fones and himself wailed: "How dry I am!"

Then, with a mysterious wink, he led us to the cellar where he produced several bo— but what's the use of naming the stuff? Anyway, after partaking of several units of volume of said amber fluid, we, that is, Joe and yours truly, ventured forth for some air to cool off our mouths. Joe had taken a little more than was essential to complete equilibrium, and Y.T. himself was none too normal. However, we could still walk without artificial support.



On the way home we passed a brightly lighted store over which hung a sign "Malt & Hops". Now up to this point we had succeeded in controlling our thoughts and our means of locomotion fairly well, but the wood alcohol we had imbibed of was now really beginning to show its

effects, such as mild blindness, mental derangement, etc. According to the clerk in the store, the following is what happened after we had reached there:

Joe and I were staring stupidly at the window, when Joe said to Y.T.:

"Say, Bob, isn't that one of the old Clapp-Eastham Hi-Tone sets?"



"That's a helix!"

"It sure looks like the old peep box", answers I, "Let's go in and ask the old geezer what he wants for it."

We toddled in, and in a loud voice demanded what amount of mazuma, kale, or legal tender would place in our possession the contraption now reposing gracefully in the window.

"For the love of Mike, fellers, not so loud, a cop might hear you."

"You can tell any of those pie-faced, pin-headed, jelly-fisted cops to go chase himself with the wampus gaboodle. I wanna see that set out in the window," yells Joe.

"That set? oooh— you mean the—", then, with an understanding wink, he led us to the back of the store, where we viewed a duplicate of the thing out in the window.

"Gosh", said Y.T., "the tubing on this OT is pretty thick."

"Where's the secondary of the blooming thing, anyway?" queried Joe.

"What are you talking about, secondary?" answered the clerk, "Do you want to know how to work the thing?"

"What's the input of the transformer?" I asked.

"Input? You mean what do you put into it? Y' see, you pour water in thru this hole here—"

"I thought oil was used in the condenser", said Joe.

"—first connecting this plug into a lamp socket."

"Where do you put the key, in the aerial?" I asked.

"Key? There's no lock on the thing. As I was saying, you put the plug into the socket, like this, and then turn the switch on."

"I don't hear the rotary going", interposed Y.T.

"Rotary? Oh yeh, you mean the malt and hop mixer. Just feed the malt and hop into this hopper—"

"That's a helluva big oilcup", pipes up Joe.

"—and press this button. That starts to mix it up with the water—"

"Won't that short the condenser?" asks Joe.

"No, it won't make it any shorter. Y' see, after the water has dissolved the malt and hops, and is boiling hot—"

"Hey, this transformer is getting as hot as Hades!" I cried.

"Is the temperature 100 yet?" asked the clerk.

"100? It looks as if you have 220 on that line."

"220? It only has to be 100, m'boy. As I was saying, after the mixture is boiling hot, it passes thru this condenser," indicating the spiral of copper tubing, "and

is distilled."

"That motor isn't still at all," said Joe, "and that thing isn't a condenser; its a helix."

"Helix? Who licks?"

"Say, how's the quenching?" I inquired.

"That stuff that comes from that condenser will quench any thirst. It contains 39%—"

"I told you it isn't a condenser; its a helix."

"What do you mean helix? This copper tubing is the condenser."

"Say, we know a helix when we see one. That's a helix."

"Say, don't you think I know my business? I said that that thing is the condenser."

"That's a helix!"

"That's the CONDENSER!"

"THAT'S A HELIX!!"

"THAT'S A —", then for the first time perceiving our condition; "Say, you guys don't have to make it; you've had enough for a month. Come, now trot along, and go home to sleep like good boys."

And with that he kindly led us to the door.

As I was saying, a radio concert is the indirect cause of many things. If you don't believe it, I do.

## Increasing the Tuning Range of Regenerators

By McMurdo Silver

THERE is probably no amateur receiver in present use that for popularity can compare with the type originated by the famous "Paragon", or, to be exact, the type of receiver employing variometers for tuning the grid and plate circuits; and if we are to judge its popularity and efficiency from the number of its operators, it will be quite some time before it is superseded by a simpler or more efficient short wave receiver.

However, there is one respect in which it is not entirely satisfactory, and that is in regard to the wave length range covered by the ordinary variometer set. The best sets of this type tune from about 150 meters minimum to 400 meters maximum or slightly over, and when we find one that tunes up to 600 meters, we may safely assume that something has been sacrificed at the minimum limit to permit this.

If amateurs are to do most of their work below 200 meters as the law requires, and as is now efficiently possible by the use of C.W. transmitters, a receiver is required that is capable of going down to 150 meters or lower, and yet it is still desirable that the

same receiver should operate up to about 700 meters, so that commercial traffic may be picked up if desired.

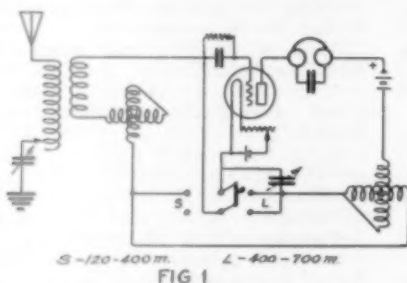
As the writer has seen no circuits so far presented that would change a variometer receiver so that it would work up to about 700 meters, and still regenerate at the higher waves, the attached figures are presented.

The main idea in Fig. 1 is to use the variometers for tuning on waves up to 400 meters, and then to throw the stator of the plate variometer in series with the grid circuit, thereby loading same, as well as providing back-coupling for regeneration above 400 meters by using the variometer as a tickler. The same switch that accomplishes this also throws a small condenser, either fixed or variable, across the total grid inductance, thereby further loading this circuit as well as sharpening the tuning, as the variometers alone do not tune sharply above 400 meters.

It would have been possible merely to load up the grid circuit by the use of a small fixed or variable condenser, as shown in Fig. 2, but unfortunately this method does not take into consideration loading the

plate circuit to produce regeneration at the then greater extreme range of the receiver. Using a condenser in shunt with the plate variometer is not an entirely satisfactory arrangement as it is more difficult to produce regeneration by tuning alone at these higher waves.

Considering the simplicity of the arrangement of Fig. 1 and the fact that no additional apparatus is needed outside of



the short-wave set than a small condenser and a switch, which might well be a D.P.D.T. anti-capacity key-switch with two positions, this circuit should meet with some favor, as its ready adaptability to present amateur receivers is at once apparent.

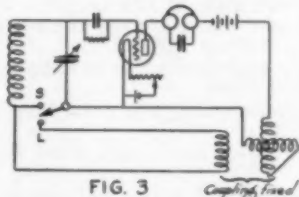
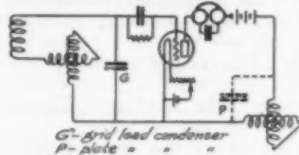
Speaking of work done with a set of this type, the writer remembers altering permanently to a straight tickler set a Grebe variometer receiver which was put on a ship just after the Armistice. The operator remarked among other things that he could get stations QSA on it that were entirely inaudible on the ship's oscillating receiver, either set using only one tube, of the same type. It is hardly necessary to tell what can be done on the lower waves with a set of this type, as most of us know how a short wave set works.

No mention is made of the antenna circuit, as most receivers have enough antenna inductance to tune to 700 meters, or can easily be made to do so.

It might be well to mention another slightly different type of receiver that would, however, be of more interest to those contemplating the construction of an entire tuner. In this type, the circuit of which is shown in Fig. 3, a condenser is used to tune the grid circuit with a variometer in the plate circuit to produce regeneration. Above 400 meters, a grid loader is cut into circuit which is tightly coupled to the plate variometer, which then acts as a tickler. This circuit is simpler than that of Fig. 1, but Fig. 1 seems preferable for short waves, and if a variable condenser instead of a fixed is used across the grid inductance it seems to be better over the upper range also, altho not quite as sharp in tuning on the lower range,

due to the absence of capacity in the grid circuit. [Fig. 3 is essentially the circuit of the Paragon RA-10 and The Tuska regenerator.—Ed.]

No dimensions are given, as everyone must work under different conditions, and it is merely the intention of the writer in presenting these circuits to show how present receivers may be made more flexible with little or no loss of efficiency.



## Station Reports

THE publication of Station Reports has been abandoned because, as Goldberg says, "they're fine but they don't mean anything."

No doubt they bring a glow of pride to the station owner who is reported as loudest or most consistent at a certain point, but he already knows that by actual operation on the air. What about John Smith, who fancies that he has the 6th best station in his district and wants to know how he stacks up alongside Bill Jones? It doesn't tell him a thing, and it can't unless it attempts to list all the calls heard in the order of their strength and consistency, obviously out of the question. In other words it is a department that has been of no value except to what might be called the "ten-percenters"—it didn't do the "ninety-percenters" any good.

That space is therefore going to be devoted to more "Calls Heard", where by the regularity with which one's signals are reported a far more accurate idea can be obtained of the range and reliability of one's signals—and John Smith and Bill Jones will have just as much chance as the three best stations in their district.

It is requested, however, that members of the Operating Dept. staff continue forwarding these reports for the special information of Headquarters in laying out relays, etc.



## Some Operating Notes on the Larger Sizes of Transmitting Tubes

By W. C. White\*

Presented at Meeting of Radio Club of America, Columbia University, March 30, 1921

**A** LARGE number of experimenters in radio communication have had experience in the operation of three-element vacuum tubes for reception, and a considerable number have used the very small sizes of transmitting tubes which generate a few watts of high-frequency energy. Comparatively few have had experience with the higher powered tubes.

Although the principles of construction and operation in the larger tubes are no different than in the smaller ones, many effects that are negligible in the latter are so magnified in the case of the larger tubes as to be very noticeable or give trouble.

Some of these points which in general are of importance only in the case of the larger tubes will be discussed; first, as regards installation and, second, as regards operation and care. Only points arising in the use of tubes in radio transmitting equipment will be considered.

It has been found that in the case of the larger tubes the majority of accidents to the tubes themselves and to the auxiliary apparatus occurs during the period of development of circuits, testing and adjustment rather than during regular operation. With most radio experimenters testing and circuit adjustment are the common state of affairs and routine operation or less secondary. Therefore a knowledge of some of the precautions to be observed is of particular importance to experimenters. The points to be observed apply mainly to tungsten filament tubes.

### Installation

The tube should be mounted in the correct position which is usually specified. This is of importance because tubes have been exhausted, aged and tested in this position and the filament has taken a more or less permanent set. Operation in another position may change the characteristics or shorten the life.

In general tubes are designed to give rated output with natural ventilation. Ample free natural ventilation is essential. Forced cooling by a fan or blower, however, gives an added factor of safety and should be used if tubes are to be overloaded. This question of ventilation for the bulbs is of

particular importance when groups of tubes are used. In such cases liberal spacing between tubes should be allowed.

Nothing should be very close to or touch the bulb. A light inflammable substance so placed may catch fire and a metal in contact with the glass is liable to set up a strain in the glass tending to start a crack.

The tube should be protected from any continual vibration, such as that from rotating machinery, by spring or rubber suspension mounting. Continual vibration is liable to shorten the life of the filament.

It is advisable to use A.C. for filament excitation. Its use gives an added factor of safety and prolongs the filament life. If an instrument is used for filament adjustment, use a voltmeter rather than an ammeter. In case a voltmeter is used the leads from its terminals should be brought right up to the socket connections as the drop in the filament wiring may be very appreciable, owing to the relatively heavy filament currents at low voltages. A step-down transformer is by far the preferable way to operate the filaments. The regulating rheostat should be in the high-tension circuit or power side and the return of the grid and plate circuits should be to a center tap on the low-voltage coil supplying the filament. In case such a center tap is not available a resistance not exceeding about 100 ohms may be bridged across the filament and the return connected to the center of this resistance. In the use of the center tap on the transformer coil at long wave lengths two bypass condensers should be used, one connected between the center tap and each filament lead.

The circuits should be so arranged that this center tap on the filament coil and also the negative lead of the direct current high voltage source are both at ground potential relative to high frequency potentials. If this is not done heavy circulating high frequency currents will flow, cutting down the output and, in the case of higher powers, endangering the insulation of the filament transformer or circuit. If in combination with this bad feature the radiation ammeter is placed in the ground lead of the antenna circuit, the true antenna current may be only a fraction of that indicated by the meter.

\*Research Laboratory, General Electric Co.

In arranging the oscillating circuit and coil system great care should be taken to thoroly insulate the grid and plate leads to the tube and the coil sections connected to these leads or any apparatus in them. The peak potentials, that, owing to poor adjustment, are possible between these two portions of the circuit, are sometimes very high and a breakdown between them may put full positive plate potential on the grid with disastrous results to the tube.

Tubes delivering 50 watts or more should be provided with a safety spark gap, mounted at or near the socket terminals, between the grid terminal and one filament terminal. As stated above a circuit condition may easily exist that causes a very high voltage to be set up between grid and filament. It is impractical to construct a tube and base to withstand these abnormal voltages which only occasionally occur and only with an improperly arranged circuit. Therefore the use of such a spark gap is a very important protective feature. For a 50 watt size of tube a  $1/16$ " gap is suggested and a  $1/8$ " gap for a 250 watt tube. The closer the gap the greater the factor of safety but too close a gap may often spark over causing an indistinct signal or poor articulation in the case of telephony.

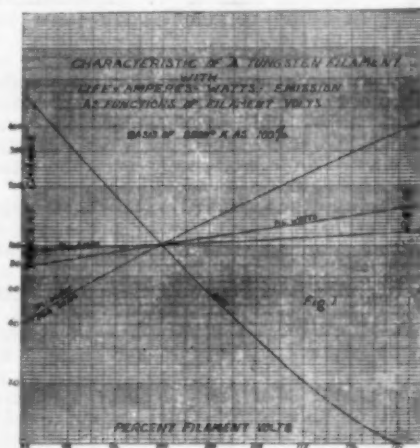
In the parallel operation of tubes, trouble is often experienced with local ultra-high-frequency oscillations in the plate and grid circuits which prevent the realization of full output and cause excessive plate and grid currents. In order to avoid this effect it is recommended that an inductance of a few micro-henries (10 turns in one layer on a one inch diameter is suggested) be inserted in one or more of the individual grid leads of each tube as close to the grid terminal of the socket as possible. The protective gap mentioned in a previous paragraph should be between the above coil and the grid terminal of the socket. The best arrangement is to mount the gap directly on the socket terminals and one terminal of the coil directly to the grid terminal of the socket.

A fuse and a D.C. milli-ammeter in the plate lead wire are of great value when adjusting the circuit. The fuse should be one that will blow at about double the rated value of plate current.

The most commonly used method of modulation employed in a vacuum tube radio transmitting equipment utilizes a tube as a modulator in addition to the oscillator tube, the plate current for these two tubes being fed thru an audio-frequency reactor.

In a radiotelephone transmitting equipment the degree of modulation is of equal importance to the amount of antenna current as far as the strength of the received speech is concerned. The antenna ammeter does not usually indicate whether the out-

put is being modulated in the normal manner. One simple method of keeping a check on this is to insert a miniature lamp in the plate circuit of the modulator. This flashes up when the microphone is spoken into and acts as an indicator of the operation of the microphone and modulation circuits. A type of lamp should be chosen that will show a low degree of brilliancy with the plate currents obtained on the tube used. Even for the 5 watt size of tube such lamps are easily obtainable. Automobile types of miniature lamps are recommended.



In most cases direct current is utilized for the plate voltage supply, and is obtained from a small generator or group of generators or by means of some form of rectifier at commercial A.C. frequencies.

If the high voltage is obtained from a D.C. generator or generators, it is advisable to use some sort of protective device for the armature windings. For small machines of 500 volts or under a condenser of about  $1/4$  microfarad across the armature terminals is sufficient.

For voltages above 500 and D.C. power outputs greater than 100 watts, aluminum cells in series (one for about each 300 volts of potential) should be connected across the armature terminals. A fuse should be placed in the plus armature lead between the armature terminal and the point of connection of the aluminum cells, but no fuse should be in the cell circuit directly as there would then be no indication if it were blown, and the generator would thus be left unprotected.

These cells consist of two aluminum plates in a saturated solution of borax. The plates should be formed (oxidized) by voltage treatment in a similar way to the treatment of the aluminum plates in an electrolytic rectifier of the usual type.

If a two-element vacuum tube or a pair



of them are used as rectifiers, the operating suggestions given in a later section apply also in general to the operation of these tubes. The filament should also be operated on A.C., but the center tap connection is not of any great advantage in this case. The various forms of rectifier connections and smoothing out arrangements form a subject too large to be included in the scope of this paper.

### Operation

It is very desirable to operate the tungsten filaments of transmitting tubes at constant voltage rather than constant current. The filament life at constant voltage is approximately three times the life at constant current.

The emission during life at constant voltage drops slightly, but this can be easily taken care of in design if it is desired to maintain absolutely full output to the end of life. The filament current at constant voltage decreases 5 to 10% during life. For this reason it is not possible to obtain full life from a filament when an ammeter is used for adjustment.

The variation of life and electron emission with filament voltage is shown in Fig. 1. These curves show the poor economy in forcing a tube, because it will be seen that to double the emission reduces the life to one quarter. Conversely it shows the advantage of operating a tube conservatively for by reducing the electron emission to one half, which allows half rated output, the life is quadrupled. This is even more forcibly shown in Fig. 2 which shows the variation of high frequency output current (radiation current) for a 5 watt tube in a typical oscillating circuit, plotted against filament amperes. At low filament temperatures the output is entirely limited by the electron emission whereas beyond a certain point increased emission does not appreciably increase the output which becomes limited by other factors in the tube. A life curve with filament current is plotted on the same sheet and shows that, in order to gain an increase of 5% above rated output by filament temperature increase alone, the life is decreased to approximately 40% of the normal.

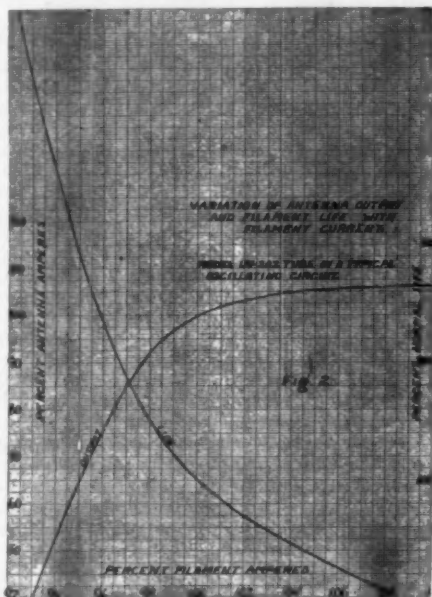
In making filament adjustments the three following points should be kept in mind:

(1) Do not materially raise the filament current to get a small increase of output. The curves of Fig. 2 show the poor economy of this. Considering operation over a period of one year it would be more economical to operate conservatively two tubes in parallel and get even a greater output than from the one running with an excess filament temperature.

(2) For long tube life the best circuit adjustment is the one showing the lowest volume of plate current. It is for this pur-

pose that an ammeter in the plate circuit was suggested in a previous paragraph. It is well worth while to experiment with various circuit adjustments in order to get a satisfactory output with a minimum input current. Expressed in another way this simply means getting as high an oscillator efficiency as possible. If a milliammeter is not available for use in the plate circuit, a miniature incandescent lamp may be employed during adjustment and the lowest current judged roughly by the filament brilliancy.

(3) The maximum rated filament voltage of the tube should not be exceeded for any length of time. In all cases the fila-



ment should be maintained at as low a temperature as possible, consistent with satisfactory results. As noted in a previous paragraph the filament current at constant filament voltage decreases during life; therefore adjustment by current is sure to result in abnormal temperature of the filament as its life progresses. All tubes are given a certain rated filament current plus or minus an allowance at a rated voltage. This, as above stated, can apply only to a tube when it is new as the filament resistance increases during life. This rating denotes or should denote the filament voltage at which the tube will give rated output at rated plate voltage thruout its average life under specified conditions. Therefore it is a distinct advantage if the user can obtain the result he desires by operating the filament at a voltage under normal. Operation at 95% normal filament voltage should double the

life of the tube. Under many conditions this is possible. Under some abnormal conditions the user must expect and accept a shorter tube life.

This question of rating is a difficult one, but not entirely unlike the rating of other electrical apparatus. Consider the case of a direct current motor rated 1 H.P. at 110 volts. This rating is fixed by a commonly accepted set of standardization rules which govern permissible temperature rises and other factors. Both the manufacturer and the user know that probably 2 H.P. is obtainable from the motor, but both also know that if this overload is persisted in disastrous results are sure to follow sooner or later and the useful life of the motor greatly shortened. Also both know that the motor will operate at an over-voltage, say 150 volts, but they also both know that this lowers the factor of safety of the commutator and that a flashover or bad sparking is almost sure to result. Eventually vacuum tube ratings will also be fixed values, but this standardization must await a wider understanding of the technical features involved before it reaches the same status as in the case of highly standardized forms of electrical machinery.

It should be remembered that the variations of life, electron emission and other factors do not bear the same proportionality to filament current as to filament voltage. This is due to the temperature co-efficient of resistance of the filament resulting in an increase of resistance with an increase of current. Owing to this factor a 5% change of filament voltage causes about a 3% change in filament current in the useful range of filament temperatures.

It may very often seem that the currents used for the filaments of transmitting tubes are unduly high.

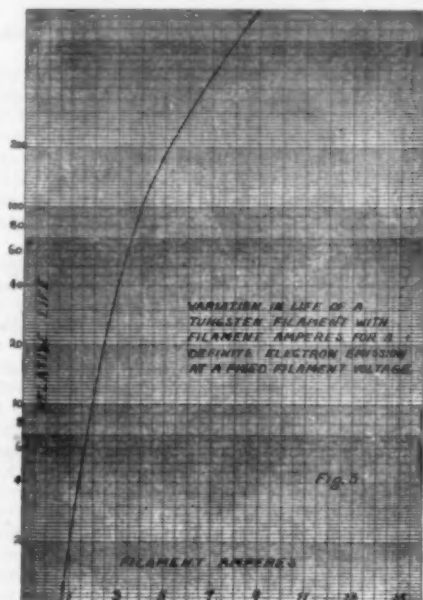
If a certain form, power output, filament voltage and plate voltage are assumed then Fig. 3 shows the theoretical variation in life that is caused by changing the filament sizes so as to utilize a different filament amperage. This figure shows, for instance, that if in a tube having a 2 ampere filament, a 5 ampere filament were substituted the filament watts would go up  $2\frac{1}{2}$  fold, but the life should increase about 17 fold. This curve is theoretical and the increases in life show could not be fully realized, because of certain practical limitations, except over small changes of filament current, but it does point out why high filament currents are so advantageous.

In experimenting with different circuits and circuit adjustments it is advisable to first operate at one-half or one-third normal voltage. In case of abnormal adjustment or faulty connections the tube itself then has a much larger factor of safety against destruction.

This same precaution should also be observed when the set has not been operated for some time. Then in case some part of the circuit has, thru accident, been changed no harm will come to the tubes and the voltage may be turned off and the circuit corrected.

Most well-made tubes will stand a great overload on the plate for a few seconds, but a continuation of an abnormally high plate temperature is sure to deteriorate the vacuum.

Most transmitting tubes have a definite plate voltage rating. As in the case of a filament voltage rating this voltage should



be the value which will give rated output thruout the average life of the tube. It is to the interest of the manufacturer to make this voltage as high as possible as it allows a higher power rating of the tube, but in all cases some factor limits this voltage. These factors are usually electrolysis of the glass of the seal, dielectric strength in the base or stem, overheating of the metal parts or glass due to the increased energy to the plate, or puncturing of the glass.

On the small types of tubes in which all the leads are brought thru a common stem, electrolysis in the seal of this stem is the factor usually limiting the plate voltage. At plate voltages above rated value electrolysis causes leakage of air thru the seal and thus unduly shortens the life of the tube. Even at rated voltage a slight but harmless amount of electrolysis takes place which can be detected by a blackening of the grid lead in the glass of the seal.

This blackening is due to electrolytic deposition on the grid lead which is the negative electrode for the electrolysis. At higher plate voltages where this electrolysis is more severe the glass of the seal in the vicinity of the grid lead changes to a dark brown color.

In a radio-telephone transmitting circuit of the usual type a modulator tube is employed and a buzzer is often substituted for the microphone when it is desired to send out interrupted continuous waves. This imposes very severe voltage strains on the oscillator tube and if an overvoltage is also applied to its plate the voltage between grid and filament may be excessive. The protective gaps described in a previous paragraph are a safeguard against breakdown due to this voltage.

Unless the constants of the oscillating circuit are changed the plate current will go up when the plate voltage is increased causing the energy loss to the plate to be rapidly increased. This, of course, is liable to cause deterioration of the vacuum.

Puncturing of the glass occasionally is

met with and is caused by the heat of electron bombardment or dielectric losses softening the glass or it may be caused by excessive voltage when the glass is a dielectric. In most types of tubes, if puncturing does occur, it will take place thru the stem between the leads inside the stem and the sleeve on the outside which supports either the grid or plate structure. Such puncturing is much more liable to occur when the glass is very much heated due to overload. It is most effectively provided against by the protective spark gap previously mentioned which should be set as close as possible and still permit normal operation. Puncturing of the bulb itself is rare at plate voltages under 5000.

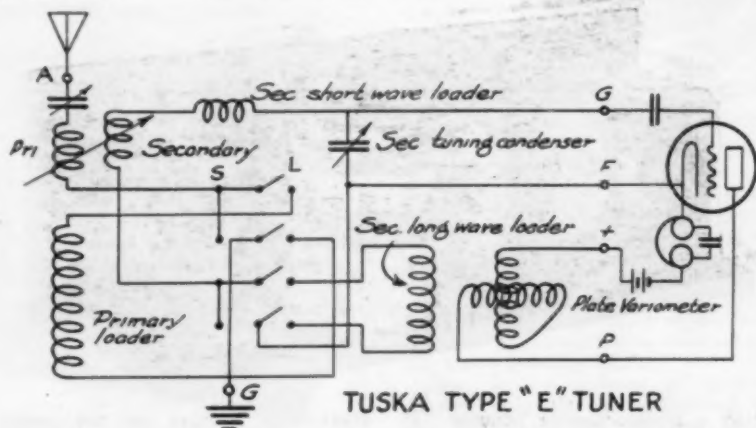
Some of the principal precautions to be observed in the use of power tubes have been explained. The experimenter with the larger sizes of tubes will find many interesting conditions and discover many new phenomena. However, he must be careful and use good judgment or an undue destruction of tubes and apparatus is almost sure to result.

## New Apparatus

**A** NEW tuner which has given an exceptionally good account of itself is the Type E of the C. D. Tuska Co., of which we present two illustrations.

This set has two wave length ranges, one from 150 to 385 meters, and the other from 375 to 810 meters. The scheme employed for securing the two ranges and for changing from one to the other is as

Considering first the arrangement for the short waves, and referring to the wiring diagram, we find an aerial circuit consisting of a variable condenser (built into the set) and a primary without taps. Coupled to the primary is a small secondary, forming a variocoupler, and in series with the secondary is a small loader, while across the two is a 13-plate variable condenser for secondary tuning. Regeneration



ingenious as it is unusual. There are many points about this set that are different from the standard design to which we have become accustomed.

or oscillation is accomplished by a plate-circuit variometer in the usual manner. The use of a condenser instead of a variometer for grid-circuit tuning is something

found as far as we know only in the Tuska and the Paragon RA-10. Condenser tuning has generally been considered inadvisable, since it tends to lower the potentials impressed upon the grid, but there is both resistance and some capacity in a vario-

meter having wound on its bottom portion the antenna loader. On the extreme left is the variometer, a Tuska moulded, and next to it, horizontal, a tube bearing the small grid loader always in the circuit and the larger loader which is cut in for the longer



meter and it is claimed that the losses are less with condenser tuning, and the tuning is sharper too.

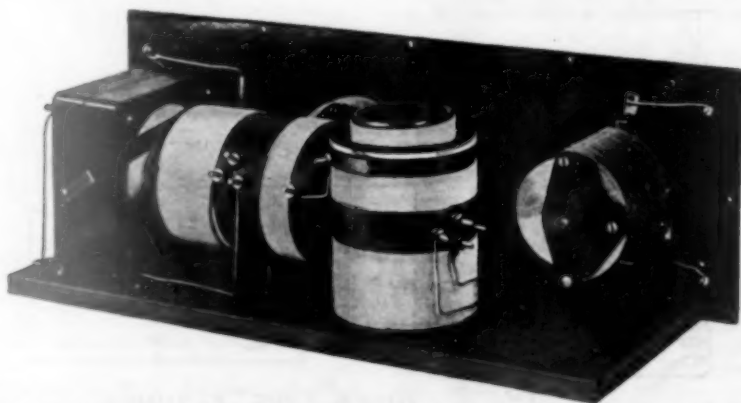
The change-over from short to longer waves is done by means of a 12-point telephone switch which is in effect a 4-pole double-throw and is so shown in the diagram. When thrown over to long waves this switch connects a load coil into the aerial circuit and another one into the grid circuit, whereby these circuits with their respective condensers are capable of covering the higher range of wave lengths. The same plate variometer is used as before but the secondary long-wave loader is placed in inductive relation to the variometer stator so that regeneration is obtained partly by tuning the plate circuit

waves and which by its location is inductively coupled to the variometer. Behind the loaders the secondary tuning condenser may be seen.

The performance of these sets has proved to be all that could be desired, in smoothness of operation, sensitivity, and selectivity.

#### The Parkin Rheo

The Parkin Mfg. Co., who last season brought out an ingenious rheostat and an equally-clever condenser, have recently improved their rheostat by placing the resistance element in a groove in the back of a three-inch moulded bakelite dial, as shown in the illustration. Like the original type, it is the resistor which rotates, a



and partly by a simple tickler process. It will regenerate or oscillate on any wave within its tuning range.

Referring to the internal view, on the right is the antenna series condenser, and next to it, vertical, is the variocoupler

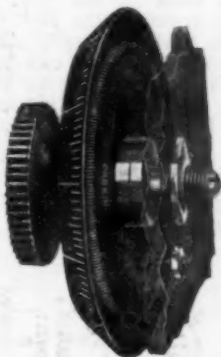
stationary contact on the panel bearing against it to complete the circuit. The dial clears the panel by  $\frac{1}{8}$ " which is close enough for good appearance and yet sufficient spacing to allow for ventilation. The resistance is 5 ohms and the carrying



capacity 2 amps.

The shaft turns in a carefully-machined bushing, insuring smooth action. Mounting this rheostat is a simple matter, only two holes in the panel being necessary, one

The  
Parkin  
Rheostat



for this bushing and a smaller one for the screw which holds the stationary contact. An "off" position is provided and a stop on the dial engages the stationary contact at the extreme positions.

#### The Vocaloud

The instrument shown in the accompanying illustrations is one which has been the subject of much discussion of late and has become very popular. It is the Vocaloud, as supplied by an eastern manufacturer, for the reproduction of radio telegraph or telephone signals of sufficient intensity to be heard many feet from the instrument.

Its popularity has been due to its efficiency as a converter of electrical energy into sound waves; the fact that no acces-



sories, such as storage batteries, are required in its operation; and its comparatively low price for either of the two styles shown.

The efficiency of the Vocaloud appears

to be due to two factors: namely, the reproducer employed and, even more, the characteristics of the sound chamber.

The reproducer is very similar to that of a phonograph except that whereas the diaphragm of a phonograph reproducer is set into vibration by the ripples from a record, the mica diaphragm of the Vocaloud reproducer is set into vibration due to its being directly connected to a pivoted armature, which is actuated by a solenoid. It will be recognized that a similar reproducer is used in certain headsets.

While the reproducer is partly responsible for the results obtained, it seems that they are chiefly due to the material and peculiar design of the sound chamber. This, which is more clearly shown in the illustration of the Laboratory Type, was



Vocaloud, Laboratory Type

designed by an acoustical expert of New York City who was almost totally deaf himself, which fact may account for the results ultimately obtained from his creation of the Vocaloud sound chamber. As pointed out by the designer, it resembles the human ear. He chose this design because he found that the fundamental design of our most used organ was quite as efficient for amplifying emitted sound waves as for receiving them.

The entire process of manufacture is known only to the acoustical expert and his associates but we are informed that the material is of a specially prepared wood compound, which is particularly suited to sound amplification, and that the sound chambers are moulded by an expensive hand process.

## Short Wave H. F. Amplification

**M**R. Ellery W. Stone of the Atlantic-Pacific Radio Supplies Co. has received so many requests for a copy of the radio-frequency amplification hook-up which he mentioned in his talk at the Chicago Convention that he has forwarded it to us and we take pleasure in presenting it.

Referring to Fig. 1, this is a scheme whereby the incoming signal is amplified at radio frequency by the first two tubes, which have tuned input and output circuits, rectified by the third tube which is a

rectifies the r.f. and the detector output is fed back to the first tube via the usual a.f. transformer H. (It is interesting to note that as there is still r.f. in the detector output, a tickler can be placed in that circuit and coupled to the secondary B for r.f. regeneration if desired.) The output of transformer H is seen to be connected to grid and filament of the first tube, so that a.f. amplification results, and the output is fed on to the second tube by a similar transformer I and again amplified before it reaches the phones.

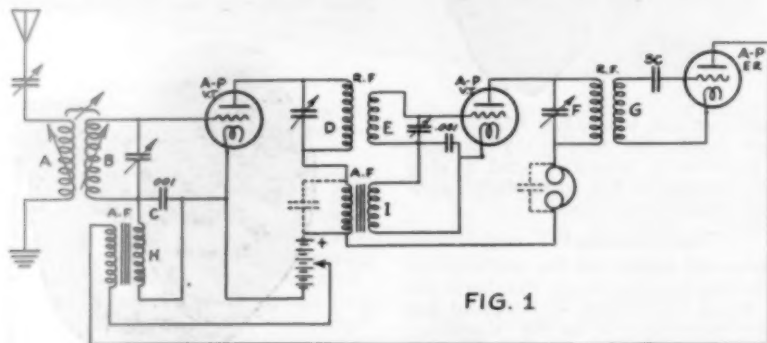


FIG. 1

detector, and the resultant audio frequency returned and fed thru the first and second tubes as audio amplifiers, the phones being in the output circuits of the second tube. The circuit will be found very selective—perhaps too selective for ordinary operation, so that it may be desirable to cut out the r.f. amplifying feature of the second tube, which would make only the first tube operate as a combined r.f. and a.f. amplifier. The diagram, however, shows the first two tubes acting in both capacities.

A and B are inductances which with their respective condensers form the usual tuning circuit, condenser C by-passing the r.f. across the a.f. transformer H. R.F. amplification takes place in the first tube (the first two tubes are "hard") and the r.f. is passed on to the second tube by inductive coupling between coils D and E, each of which is shunted by a condenser so that it may be tuned to the signal wave length. Mr. Stone suggests for this purpose honeycomb coils one size smaller than the secondary, arranged in the usual two-coil mount for variable coupling. The second tube likewise amplifies the r.f., which is then fed to the "soft" detector tube by means of two more tuned and coupled circuits, F and G, which are identical with D and E, except that no condenser is needed across G. The detector

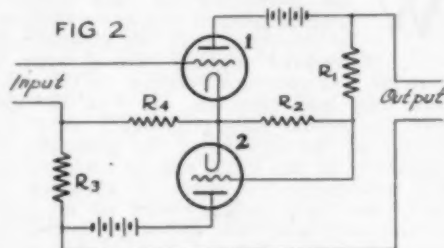
Note that a variable B battery is provided for the detector. Phones and a.f. transformers may have to be provided with by-passing condensers but generally the cord capacity of the former and the distributed capacity of the latter will suffice. It is desirable that at least two feet separation be allowed between the various sets of tuned circuits and the wires kept as short as possible and run at right angles, to prevent undesired reaction.

The British have a r.f. amplification scheme, known as the Turner aperiodic retroactive amplifier, which appeals to us as having possibilities in American amateur work. We are indebted to our valued contemporary, "The Wireless World", for the details explained in Fig. 2. In this arrangement small variations in the potential of the grid of the first tube cause corresponding variations in the plate current and consequent variations of the voltage across the resistance R, across which the grid and filament of the second tube are connected. These voltage variations are therefore impressed upon tube No. 2 and cause corresponding variations in its output current, producing much amplified voltage variations across resistance R, and, as this resistance is included in the input circuit of valve No. 1, these amplified vari-



ations are retro-actively applied to the first tube ready for additional amplification.

The usual change of potential sign takes place from the first grid to the first plate but the sign changes again from the second grid to the second plate so that the resultant potential is of the proper sign when reapplied to the first tube. The amplified output voltage is taken from the two plate circuits, and altho the normal



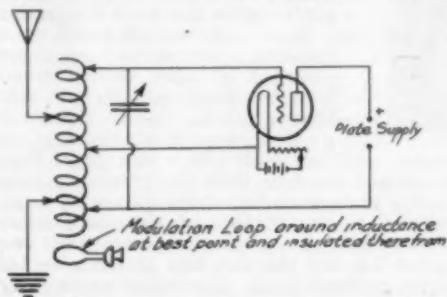
D.C. potential of these two points is the same, the instantaneous difference of potential of the A.C. components of their potentials is a maximum because of the difference in phase. This output may then be applied to the input of a detector, in the plate circuit of which the telephones are connected.

With  $R_1$  and  $R_2$  of 50,000 ohms and  $R_3$  and  $R_4$  10,000 ohms, and plate potentials of 150 volts on both tubes, the output voltage may be as much as 2,000 times the input voltage.

## Simple Modulation

By C. F. Butcher, 5AL

HERE is a simple little stunt for modulation. We are familiar with the absorption loop as a means of telegraphing with an arc set. The same thing can be applied to short-wave C.W. sets as a means of modulating the output for talk-



ing. Simply put a turn of wire around the aerial inductance of your C.W. set, with a telephone transmitter in series, and talk. No battery, transformers—not even a Ford

coil. Quite simple, cheap, and as far as I have been able to determine just as efficient for small outputs as any other scheme. Probably on a larger set the transmitter would heat.

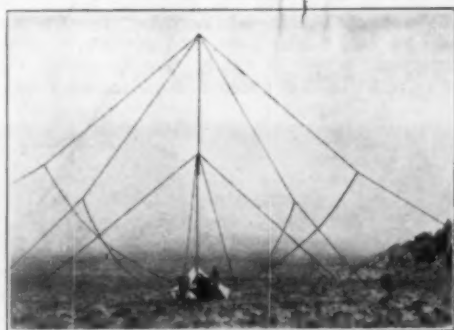
5DW of my city has used this very successfully, working up to a hundred miles daytime with clear speech and moderate intensity, on a 10-watt two-tube set putting out between .6 and .8 amp. It is easily seen that the varying resistance of the transmitter would cause the "modulation loop" to absorb a varying amount of the energy, giving good speech and probably a fairly good percentage of modulation.

## First Aid by Radio

By R. W. Goddard, 5ZJ

THE press of late August informed the people of the United States of a disastrous flood in New Mexico that wiped out the town of Hatch, partially destroyed other towns, damaged property and crops into the millions of dollars, and made it necessary for thousands of people to flee to the hills for their lives.

About six o'clock the evening of the 17th of August a cloud-burst had occurred over the mountains to the south-west of the



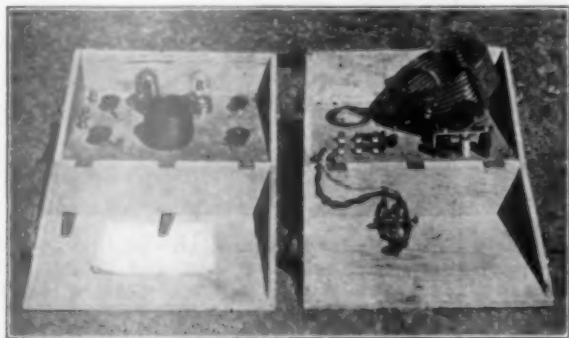
Rincon Valley in New Mexico. The next day rumors drifted down the valley that it had caused a destructive flood, washing away towns, farm houses, crops and stock. Immediate action was taken by the Las Cruces Chamber of Commerce; a meeting was called and a committee appointed to go up the valley and ascertain the extent of the damage and render aid to the unfortunate victims; a large fund was raised on the spot to carry out this work.

The writer was appointed a member of the committee and as such proposed the utilization of the portable wireless stations of the New Mexico College of Agriculture and Mechanic Arts, 5FY and 5FZ, in connection with his own station, 5ZJ, as a means of rapid communication between the

flooded area and the Chamber of Commerce headquarters at Las Cruces. The idea met with immediate favor. By rapid work with the local telephone, Mr. Earl Kiernan, a student at the College and member of the College Radio Club, was reached and obtained to assist. In an hour and a half the two stations were packed in their trailer and rolling behind the writer's flivver towards the stricken area. Two hours later we arrived at Rincon, 41 miles up the valley and on the edge of the flooded section.

The rest of the day was spent in going about observing the extent of the damage and determining the number and needs of the homeless people. The next morning one of the portable stations, 5FY, was set up at Rincon and this information radioed to 5ZJ at Mesilla Park, and from there telephoned to Las Cruces. Food, clothing, blankets, tents, and cots were sent up by truck. The Salvation Army and the Red Cross of El Paso, Texas, also had workers on the ground, all combining forces in a general relief committee so that there would be no duplication of effort. Although the telephone company soon had their lines repaired and in working order, the radio was used to a considerable extent as the cost was negligible and the service good.

At times some difficulty was experienced at 5ZJ in receiving the portable station on account of static. Invariably this would become bad about noon and get worse until sundown, when it would remain about the same until after sunrise the next morning.



It would then clear up and practically disappear. This trouble did not bother 5FY at all, the reason probably being the fact that the antenna at 5FY was much lower than at 5ZJ (96 foot fan). In fact on the morning of the 20th work was carried on while a thunderstorm raged about 5FY. Had this storm been at 5ZJ, work would have been impossible as sparks a couple of inches long can be drawn from its antenna at such times.

Photographs herewith show 5FY while

in use at the last annual College encampment, and a close-up of the portable equipment.

## Theory of Freak Transmission

By J. V. Purcell, 3ZF, 1CAR

**W**HEN amateurs first contemplated the possibility of long distance transmission it was quite naturally supposed that the strength of received signals would bear a more or less constant relation to the distance they had traveled. It was thought that the signal strength would vary inversely as the square of the distance, or something of the kind, and in consequence that communication over a distance of thirty or forty miles would be an easy matter and that the difficulty would increase with the distance until distances of 500 miles or more would be quite beyond the resources of the average amateur.

Therefore, judge of our surprise when it was found that signals were coming in from a thousand miles away like the proverbial ton of brick while those from nearby towns could not even be heard at all!

For years it was seldom if ever that any amateur in Washington heard one in Baltimore. The country between was flat and the distance thirty-five miles! We attributed it to "local conditions" and said "Can such things be?" But in time it was noticed that signals from other directions were as hard to get as those from Baltimore, and it began to dawn upon some of us that the distance had more to do with it than the good old serviceable "local conditions."

In other words, we couldn't get Baltimore stations because they were too near! Don't laugh, fellows; that really seems to be the trouble.

And now to find a possible explanation for such a paradox.

First. As we all know, most amateur antennas are surrounded by other objects which are as high or higher than the antenna, and since we conceive of electromagnetic waves as moving in straight lines, the result must be that the greater portion of the energy radiated in waves traveling parallel to the surface of the earth is absorbed by surrounding objects, and only waves leaving the antenna at more or less of an upward angle are freely propagated. According to this idea, a wave leaving a given station would produce powerful results within the first few miles, before absorption; the unabsorbed or unscreened portion would then travel at an ascending

angle, passing far above other stations, until a reflecting stratum in the atmosphere is reached, when it would be turned downward and, again reaching the earth, produce effects at receiving stations. This seems to agree well with the observed facts and would explain the "dead belt" about so many stations. Suppose fluctuating conditions in the reflecting stratum, and you have a cause for fading, a phase which has been thoroughly dealt with by Mr. Kruse.

Second. Let us consider possible effects of the curvature of the earth. Since it seems reasonable to suppose that the earth component of a radiated wave moves in a straight line (subject to possible modification) between sending and receiving stations, and we know that the air component must follow a curved or a broken line, then it follows that there must be nodes at certain fixed distances about a sending station, where the earth and air waves are in or out of phase, and it would seem that this must have a direct bearing upon the strength of the received signals, since potentials induced in antenna and ground would depend largely upon the phase of these two waves. It is conceivable that where signals were not received, excellent results might be obtained by moving one station half a wave length nearer to or farther from the other. This would apply particularly to large sta-

tions employing long waves which are not subject to fading.

Third. Many of us have observed that stations located in the country or in small towns seem to have greater success than those operated by amateurs in the large cities, and it seems to me that this might be explained by supposing that part of the energy radiated by antennas located in the heart of large cities is absorbed by the network of telephone and power wiring thru which it must pass before reaching the open country.

Fourth. Is it not possible that underlying geological conditions may have some effect upon the earth component of radiated waves? Thus a wave might be propagated along a water-impregnated stratum with ease, while being halted or deflected by a confused and broken mass of rocks. This might explain the phenomenal success achieved by our Eighth and Ninth District stations which are located upon an unbroken stratified formation of great extent. It may also have a bearing upon conditions in the Appalachian region, where the rocks are all jumbled up, and long distance transmission notoriously difficult. At any rate the above theories or various combinations of them may help to explain the riddle of "freak" transmission.

[See Editorial, "The Aurora," page 28, June 1921 QST.—Ed.]

## Improving The C. W. Ground System\*

By H. H. Beverage, 2BML

MANY amateurs have considerable difficulty in getting a low antenna resistance, particularly in locations where the soil is sandy. Under these conditions, a counterpoise must generally be used to get the antenna resistance down to a reasonable figure. In many cases, however, it is possible to combine a ground connection with a counterpoise, in such a manner as to still further reduce the antenna resistance by a large amount.

In the *General Electric Review* for October, 1920, Mr. E. E. Bucher describes the Alexanderson system for radio communication. He shows how Mr. Alexanderson has combined a buried wire ground with a capacity ground for more uniformly distributing the earth currents. In Fig. 1 of the present article the inductance of the helix below the ground tap tunes the capacity ground, while the inductance between the ground tap and the antenna tunes the antenna circuit. The section of the helix above the ground connection may be considered positive with respect to ground, and the section of the helix below

the ground connection may be considered negative with respect to ground. By suitable tuning, the total antenna current may be distributed between the capacity ground and the buried wire ground in any desired ratio.

In the case of Station 2BML, at Riverhead, L. I., the soil consists mainly of dry sand under the antenna. There is a small pond near the antenna, but not under it. A good ground was obtained in this pond by running several hundred feet of wire into it. The antenna resistance using this ground was very high, between sixty and seventy ohms at 200 to 300 meters. The writer decided that since the soil under the antenna was sandy, the high antenna resistance was due to the fact that the antenna flux was forced to travel through very high resistance soil for a considerable distance before reaching the low resistance ground wires.

A counterpoise of four No. 14 B. & S. copper wires running parallel with the antenna flat top and directly beneath the antenna was put up, the parallel wires being four feet apart and carefully in-

sulated. The counterpoise extended several feet beyond the antenna at both ends. When the counterpoise was substituted for the ground, the antenna resistance was lowered from about sixty ohms to ten ohms. By combining the ground with the counterpoise as shown in Fig. 2, the antenna resistance was still further reduced to about four ohms. The resistance of the helix used to tune this antenna was about three ohms, making a total antenna resistance of seven ohms. The above resistance values were taken at 280 meters wave length.

ground clip is put on turn No. 1, the total current divides in inverse proportion to the ground resistance and the counterpoise reactance, and, obviously, most of the current will flow in the ground lead. Since the counterpoise has little effect, the wave length is practically determined by the antenna capacity and the helix inductance between the ground clip and the antenna clip. As the ground clip is moved up nearer the neutral point, the wave length becomes shorter, due to the decrease in inductance between the ground and antenna clips, and the counterpoise reactance is

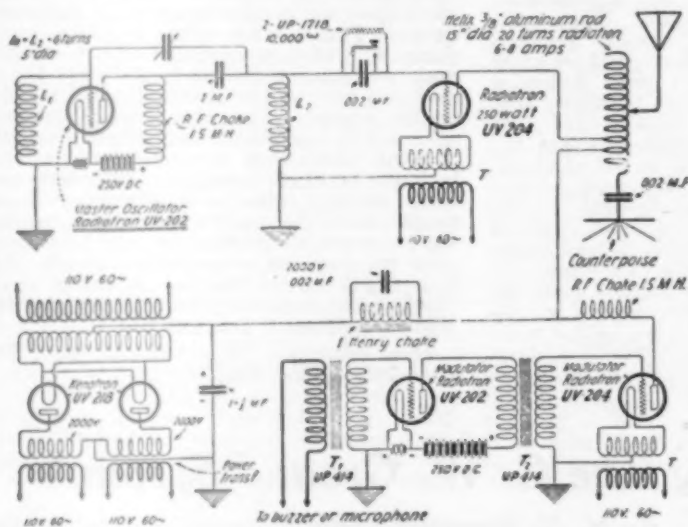


FIGURE 1

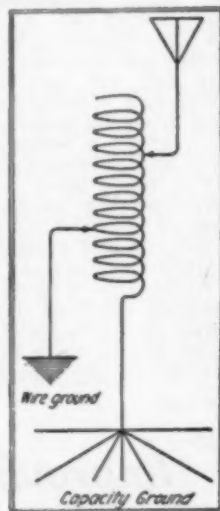


FIGURE 2

When the circuits are properly adjusted, removing either the ground connection or the counterpoise connection will not change the antenna wave length, but will change the antenna resistance only. The easiest way to tune up the counterpoise and ground is to first tune to the desired wave length, using the counterpoise alone, then try the ground clip on different turns until the point is found where the wave length is the same as with the counterpoise alone. The ground clip should be adjusted to within a half turn on a large diameter helix. When the ground clip is at the neutral point, the inductive impedance of the helix below the ground point tunes with the capacity impedance of the counterpoise, forming a series tuned circuit of comparatively low resistance. The total antenna current divides between the ground and the counterpoise inversely proportional to the effective resistances of the ground and counterpoise circuits.

With the counterpoise on the bottom of the helix and no ground connection, the wave length is 336 meters and the effective resistance is about nine ohms. When the

partly tuned out by the inductance of the helix between the ground and counterpoise clips. The effective resistance decreases as the ground clip is moved up, because the counterpoise is taking a greater and greater portion of the antenna current. When the neutral point is reached, the counterpoise reactance is entirely tuned out, and the counterpoise takes most of the antenna current.

In the case of Station 2BML, the counterpoise capacity was .0007 M.F., and the antenna capacity was .0005 M.F. When the ground clip was properly adjusted, about 75 per cent of the total antenna current flowed in the counterpoise lead and the other 25 per cent in the ground lead. With this combination, the antenna resistance was only about 40 per cent of the value obtained with the counterpoise alone.

Many amateurs already have a counterpoise, and the writer believes if these amateurs will combine their counterpoise with a ground connection as described, their  
(Continued on page 41)



# EDITORIALS

## de AMERICAN RADIO RELAY LEAGUE



### "Competing" Associations

EVERY once in a while some kind of an Amateur Wireless Association pops up, and we amateurs are urged to join it and partake of some kind of everlasting glory. Some of the fellows get worried and write in to Headquarters that So-and-So is getting up some competing relay lines, or is planning to organize some other kind of a stunt that may knock our A.R.R.L. to pieces. We at Headquarters are urged to get busy and fight. We confess an urge in the latter direction at times, but of course it is the kid still struggling within us.

This notion of our being knocked to pieces by some "competing" organization always makes us wonder how long it will take some of us to get hold of the real big idea that stands back of our A.R.R.L. To these we say, there never can be any "competing" organization. We amateurs of the country are the A.R.R.L. How can we compete with ourselves? It is like warning a man to look out or he will get his job away from himself. The A.R.R.L. is U.S. We built it ourselves, we American Amateurs, and we own it—you and I and the other fellow. As long as we stand by each other we own and control the Amateur Wireless Association that is the strongest, the most forward looking and in the highest regard of our Government. We have the only association that has no commercial strings attached to it of any name or nature. Every cent we accumulate from paid advertising in our own magazine, and from our dues, is ours to spend upon ourselves. And finally, we are governed absolutely by ourselves, just as our American Government is. Our Board of Direction is our Congress. It is elected every two years by the great body of amateurs. Every part of the country is represented, from the Atlantic to the Pacific. Two years ago the amateurs elected the gentlemen whose names and addresses appear upon the first page of this magazine. Next spring the amateurs will elect a new Board of Direction, and this Board will in turn elect its officers.

When it comes to a "competing" association, it can only be by us amateurs giving up our own and presenting ourselves to some commercial organization so the latter can make money out of us. We may be

easy, but we are not that easy. How about it, fellows? Are we right or wrong?

### Enter The Post Office

WE wish to advise our members that there is a movement on foot apparently having for its aim the transfer of the radio inspection service from the Department of Commerce to the Post Office Department.

As we all know, our government at Washington is making strenuous efforts to reduce the cost of Uncle Sam's business, and along with the institution of the budget plan the U.S. Bureau of Efficiency and the special Committee on Reorganization of the Government Departments have been working on a plan to reorganize the executive branch of the government to eliminate duplications of work and overlappings of authority. Apparently it has been proposed by the Committee that the administration of all radio on land, including amateurs of course, should be transferred to the Post Office Department. The Department of Commerce in fact advise us that the Committee has it under consideration, but that they can tell us nothing more. We understand there is an order out that any employee who interferes in departmental reorganization plans is to "get the can" instantly. The Post Office as yet can't tell us anything either but, to quote them, can advise us "that the Post Office Department plans to take an important part in all government communications such as befits the purposes for which this Department was created". In an interview given out on September 2d Postmaster-General Hays talked extensively of government monopoly of radio under his department. This may or may not be the way in which Mr. Hays officially views the matter.

The improvement of government efficiency is something we all want to see, and we shall go slowly in saying anything about this matter. At the present writing, however, we can't for the life of us see what is logical about transferring us from our good friends, the Commerce folks, with their years of experience in radio, to a department that has no connection with such matters and talks of government monopolies. There is nothing to do just now but to sit and watch, but if it becomes desirable that we amateurs make ourselves

heard on the subject the membership of the A.R.R.L. will be informed.

### Directors

**P**RETTY soon our A.R.R.L. will have another election of Directors, to serve for two years. All of us ought to give thought to the men we know who can best serve our organization.

Directors don't necessarily handle traffic, and the best Director is not necessarily the loudest station you know. These men have to exercise real judgment in determining the policy of our organization and in deciding its important affairs without fear or favor, and so they need other qualifications more than they do the honor of possessing the heaviest rock-crusher in a community.

We want men of sober judgment and the requisite amount of radio knowledge. The election comes early in 1922. Think it over.

### Work to Be Done

**L**AST month we set down on paper quite a few thoughts concerning the possible improvement of conditions on amateur wave lengths, but our readers will remember that we were crowded for room in the October number and our printer, as is his distressing habit, telephoned us that we would have to boil it down to get it in the space available. And so in one little paragraph we summed up a number of things that occurred to us as being desirable in our little world of 200 meters. This month we may fare better.

You know, fellows, we have but one "air" to use, and almost all of us are down in a very limited band of frequencies, so that a certain organized effort to standardize certain practices is going to be necessary if room is to be found for all of us, with our varied interests, to enjoy the possibilities of Citizen Radio. We wish to present the following topics for the consideration of A.R.R.L. men everywhere:

Message relaying, to be reliable, has to come to the short-jump system. Traffic work between powerful stations can still be carried on over six hundred to a thousand miles in the wee small hours after 98% of the bunch has quit for the "night", but in those hours that we can expect to have enough on watch to put traffic thru wherever it needs to go, such operation is impossible. It will be apparent to everyone, we believe, that short jumps are the only method that will move traffic with any reliability.

The use of wave lengths less than 200 meters should be encouraged. The law must be obeyed and that means that general amateur stations must not exceed 200 but it does not mean that the whole field has to be jammed between 195 and 200.

Dropping down to 185, 175, or even 150 meters is going to solve many an interference problem. Try it—as yet there are mighty few stations there and you can do real work while the mob on 200 fusses about QRM. We will bet a pink hat we could work from Hartford to Chicago on 50 meters if we had to, and if QRM gets much worse we are going to try it.

Decrement is just as vital a thing as wave length. If waves are sharper there can be that many more of them without embarrassment. The law says "not to exceed 0.2". Many many stations do not meet that requirement but even that should not be good enough for us. We ought to whittle it down to a cat-whisker. Do we hear some inquiries "Why should I bother about my decrement as long as it seems good enough?" We have the answer: "Simply because you can't expect the other fellow to bother about improving his, to help your reception, unless you're willing to do the same thing for him." Loosen up that coupling, fellows, and saw the ohms out of that ground connection.

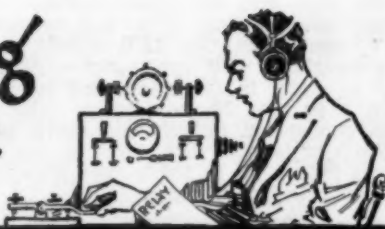
Plans for the division of operating hours according to local sentiment in large communities have never failed to help. Wherever within a small territory there are many operators of various ambitions and at various stages in the game, such a scheme is well-nigh indispensable. The A.R.R.L. recommends for this purpose some such method as the Chicago Plan, in which provision is made for the requirements of all classes of stations, even the DX stations who are not interested in relaying. Affiliated clubs can do no more useful piece of work in mitigating present QRM conditions than by sponsoring some such plan in their locality, but extreme care should be taken to have it representative of the desires of the big majority of the community and not of any little group.

And last come Listening Hours. The chief appeal in amateur radio is in hearing a fellow a tremendous distance away and in having him hear your own signals. If QRM gets so fierce that our range, both transmitting and receiving, is confined to our home county, the fun of the game will be all gone. Conditions are tending that way now, so we are proposing the listening hours as a simple co-operative way by which we can still have some enjoyment of the DX possibilities of our equipment. The schedule of listening hours, with a map giving all details, was published on page 18 of August QST. The time for putting these into effect is here—they are in effect. Let us follow them and urge our neighbors to do likewise, that we may get the greatest benefits from the plan.

DX will never have better air than we are enjoying right now, fellows, except to the extent that we can by team-work improve the conditions under which we use it.

# The Operating Department

F. H. SCHNELL, Traffic Manager  
1045 Main St., Hartford, Conn.



**J**UST look at the number of messages handled in each division this month. It represents a prophecy, which is this: we are going to have the biggest and best radio season in the history of amateur wireless. We have not the nerve to go further by predicting what is on our mind. Too many of you would call us crazy. Already we are being vindicated by the performance of CW and we venture to say that before the end of this year CW signals of less than one kilowatt will span the continent. It will be done beyond a doubt or we will use up the entire space of this department trying to explain why it was not done. The old familiar sparks will hold their own in their class, but they will not be in the same class with CW stations. Bear in mind we do not want to be partial to CW, but we can not stand in the way of progress and CW is progress in amateur wireless. We have stuck to the spark through thick and thin, and it was not until CW had shown its superiority over our old pal the spark that we sincerely began to think it had seen its best days as the premier set of the modern amateur. We do not apologize for our old spark; it did its part. One reason why CW is confined to a few stations is the fact that but little is known of the handling of a CW set. Another point is that it tunes rather sharply and it requires care and skill in manipulating a receiver when you go after a CW signal. We admit freely that a tuner simpler in manipulation is desirable for CW reception, but that will come in time. However, we need not excuse the tuners of today. Properly handled, every one of them of the three circuit type will bring results that will astound you, but you must listen for CW.

The honors for this month go to the Atlantic Division.

\*\*\*\*\*  
MR. R. W. E. DECKER  
White Plains, N. Y.  
2UA, 491 Messages  
Atlantic Division  
\*\*\*\*\*

Reports for messages handled by divisions are as follows: New England, 625; Atlantic, 2989; West Gulf, 427;

Northwestern, 147; Central, 1212; Ontario, 109; Delta, 9; Roanoke, 205; Midwest, 125; East Gulf, 182, and no message reports from the following divisions: Dakota, or Pacific. Total reported, 6030, which probably does not represent more than 40% of our traffic. It represents the number reported and shows that 60% of you fellows are not reporting your message traffic. Next month we are going to know what percentage of our traffic is handled by CW and what percentage by spark. Make your division reach a higher percentage by reporting your traffic to your Division Manager. Help him, help your division and help yourself by sending in reports every month.

Division reports follow:

## NEW ENGLAND DIVISION

G. R. Entwistle, Mgr.

A.D.M. Castner (1UQ) reports the Portland Convention as a great success socially and educationally. 1UL has succeeded in working Canadian 9AK. He had no difficulty and hopes to establish a schedule. 1FV put his sync. gap on a non-resonant transformer, punched the key and observed the fourth in fitting style. He had inquired about a condenser. The Portland Radio Club is now in full swing at the Y.M.C.A. under the efficient direction of H. C. Sever.

A.D.M. Mix (ITS) reports 1HO has erected a new cage antenna. 1BM is also making some improvements, including a new cage antenna. 1QN is on again and has a schedule with ITS to handle New York traffic. ITS is taking Boston traffic from 1PS every night and Rhode Island and lower Massachusetts traffic from 1XX, all stations CW. ITS is also working Canadian 2BF (CW). 1ANQ has made improvements in his antenna system and has stretched out to Chicago with his 50-watt CW set. 1AUV has been heard in Bristol QSA daylight and future traffic will be routed to him. Mix reports 107 messages via ITS; 1BM 14; 1HO 83; 1BOP 85; 1BLK 47.

Vermilya reports handling 204 messages in the past month—he has his old Grebe “sink” gap back again now. Banks, 1BOP, handled 85. 1CK has only handled a dozen or so account considerable minor trouble. 1DY is on again all fixed up and is creating

a big stir with his stone-crusher. Cumming, summertime 1FB and wintertime 1BV, has dismantled 1FB spark set and has bought a 500 cycle motor generator and is going in for modulated tube work with a pair of 50-watt tubes. The Portland convention finished his spark set.

We sympathize with 1AU in the death of his father, A. B. Davis who always took a deep interest in radio.

#### ATLANTIC DIVISION

C. H. Stewart, Mgr.

Northern New Jersey, F. B. Ostman, 2OM, Supt.: Activity in this district seems to have reached the peak of last winter already. It has become necessary to appoint Asst. Dist. Supts. to keep the old ball of the A.R.R.L. rolling. R. S. Johnson, 2AWL of Red Bank, N. J., has been appointed Asst. Dist. Supt. for Central Jersey which includes counties of Ocean, Monmouth, and Middlesex. Operators are requested to send their report to him not later than the 17th of every month. J. A. Erhard, 2UE, has been appointed City Manager of Hoboken. F. H. Canfield, 2ALY, has been appointed City Manager of Newark. A CW shore route has been established from Northern N. J. to Coast stations. Included in it are 2PE, 2ANZ, 2RR, 2AJF, 2BG, 2BBN, 2IA, 2DF, 2AWL, and 2AXB. This route is entirely reliable for quick communication. Old rock crusher 2VA has fallen for a doll and will not be with us this winter. (2-to-1 we will hear 2VA again before many weeks roll by.—T.M.) Messages handled as follows: Sparks, 2OM-438, 2UK-40, 2SQ-23, 2ARB-58, 2BG-60, Total 619. CW, 2AJF-61, 2RU-26, 2AWL-101, 2RR-54, 2IA-35, Total 437. Grand total, 1074.

Capitol District, F. H. Myers, Supt.: 2XQ will resume operation in charge of ex-8TB. 2AWF has been consistent and will prove of great help. Nothing definite on 2SZ. (Come on 2SZ, we need you.—T.M.)

Hudson Valley District, C. E. Trube, 2BK, Supt.: 2BM is back on the job to QSR to the north. 2OA is back again in spite of his threat to quit. He has stuck in a coffin and sink gap. 2UA clipped off 491 messages last month and is doing good work with the first district stations. Mr. Decker of 2UA has been appointed Asst. Dist. Supt. 2BK handled 124 messages. No other reports received. 2DJ, 2AID, 2HJ, 2OA, 2DN, and 2BFZ have been heard handling traffic, but no reports.

Western N. Y., Benzee Bros., 8FE, Supt.: Traffic has not shown a material gain as only 147 messages have been handled. 8AGK is making a 100 cycle spark set. City Mgr. Young of Elmira is still using CW. 8QM does good work with his 10 watt set, and has been appointed official

relay station. 8VW will be appointed as soon as he gets going. 8TY reports rotten DX. (Must live near T.O.M.—T.M.) Woodsworth reports a new station in ex-9ALB who is hooking up with Woodsworth. The spark set at 8ED has gone into the scrap pile while CW supplants it. Work on a daylight route between Buffalo and Troy and Albany will be completed this month. Efforts will be made to run it to New York City. No reports from Rochester, Lockport, Niagara Falls or other points in this district.

Long Island, H. S. Collins, Supt.: 2AJW has been improved. Four five-watt tubes are giving an antenna current of 2.5 amps. Regular schedules are maintained with 1HO and 3BA. 2AJW handled 143 messages. 2BRC handled 44 messages. 2CY has 44 to his credit for the latter half of the month. 2VD is back again and will help 2CY. 2ZV is doing good work with a high power CW set. 2ZL has not been heard lately, but we expect him on most any night. 2BGR is still out. 2EL has been heard on CW. Only recently 2EL got all excited when he heard that 2JU was going to junk his spark for CW and rigged up a CW set. 2OE wants to sell his spark and use 50 watts of CW. 2AWS reports 24 messages. 2CY has been appointed Asst. Dist. Supt. over stations on the North Shore and west end of Long Island. All reports should be in J. C. Newton's hands by the 17th, addressed to him at Bayside, L. I.

New York City, Dr. E. A. Cyriax, Supt.: 2DI has installed CW, but the 500 cycle spark has not been junked. 2DI reports 87 messages. 2XK-207. No reports from 2CT or 2IF. (2CT CW has been heard by T.M.) This District is so badly congested that it has been necessary to divide it into zones. The Bronx has been divided in two zones with Mr. Cockaday in charge of Upper Bronx which runs to 170th St. Lower Bronx is in charge of Mr. Thury. Lower Bronx runs south from 170th St. West Manhattan Zone includes all territory 69th to 125th St. on West Side and Mr. Davidson, 2LM, is in charge. East Manhattan Zone is on the East Side and extends from 42nd St. to 130th St. and will be handled by the Dist. Supt. Southern Manhattan Zone covers territory south of West 59th St. and south of 42nd St. This territory is in charge of 2ALG, Mr. James Wood. 2ACT-144 msgs., 2BCF-54 msgs.

Brooklyn, F. A. Maher, Supt.: 2ARY is back from Connecticut and reports 159 msgs. 2TS reports 37, 2MJ-5, 2FP-16, 2WB-50, 2RM-46. No report from Southern N. Y.

Eastern Maryland, G. L. Deichman, Supt.: Messages reported, 3UC-15, 3OU-14, 3AC-12, 3HG-8, total 49. 3HG has closed the spark for a while and is using 5 watts of CW. Using the Traffic Man-



ager's pet circuit is putting 1.9 amps. in the antenna and has covered the same DX as the spark. 3AHK has come forward with CW and is getting excellent results on the same circuit. 3RM and 3EM will come out with a 50 watt CW set.

Eastern Penn., S. W. Place, Supt.: P. C. Peterson of Folcroft says that QRN has let up a bit and traffic work is on the upgrade again. 3CC and 3HX are handling most of the traffic. 3BG reports 10 msg. and is using ten watts of CW in addition to the spark. 3HJ is using CW for local work while his spark is out with condenser trouble. 3HJ's CW is QSO 3ZO-3GR-3RW and 3AQL. He reports that 3AAN of Millville, N. J., has been working on a line from New York to Millville, which is about half way between Philly and Atlantic City. The line stops here. However he can QSR Jersey Shore and Washington. 3HJ handled 24 msg. 3FR says that branch line #1 is not open as yet because 3PU has not returned to school. 3FR on CW work 3AFE, 3GR and 3LP. 3HJ reports 10 msg., 3CC reports 25.

Central Penn., H. M. Walleze, Supt.: The few stations closed for the summer have re-opened and traffic will move henceforth. On the Northern Route 8HR has been installing spark. 8BQ is now ready again after overhauling. No reports received but know 3AQR is reaching out. In addition our old standby 8XE is back with us again and doing his share.

#### WEST GULF DIVISION

Frank M. Corlett, Mgr.

Due to continued and substantial growth of this division some changes in the organization become necessary in order to more efficiently handle the work of the Traffic Department. Four "Sections" have been created as follows: Northern half of Texas to be known as the "Northern Texas Section", Southern half of Texas to be known as the "Southern Texas Section", State of Oklahoma to be known as the "Oklahoma Section", State of New Mexico including the Texas Counties of El Paso, Hudspeth, Loving, Winkler, Ward, Reeves, Jeff Davis, and Presidio, to known as the "New Mexico Section". An Assistant Division Manager will be in charge of each "Section". Sections will be divided into not more than four "Districts". A District Superintendent will be in charge of each District.

Appointments have been made as follows:

Southern Texas Section, Asst. Div. Mgr. Alfred P. Daniel, 5ZX, 2504 Bagby Street, Houston, Texas.

Southeast Texas District, Hallet E. Worthington, 5ZV, 4909 Park Drive, Eastwood, Houston, Texas, District Supt.

Southcentral Texas District, Wesley H. Tilley, 5ZU, 4112 Avenue F, Austin, Texas,

District Supt.

Southwest Texas District, Ed. Nettleton, 5ZN, Eagle Pass, Texas, District Supt.

All other Southern Texas appointments have been cancelled.

Northern Texas Section, Asst. Div. Mgr. Harold P. Heafer, 5AJ (and remotely controls transmitter at 5ZC) 516 West Jefferson Ave., Dallas.

Northcentral Texas District, Guy Neel, 5XJ, Dublin, Texas, District Supt.

Northwest Texas District, J. L. Martin, 5IF, 605 East Fourth Ave., Amarillo, Texas, District Supt.

All other appointments in Northern Texas have been cancelled.

Oklahoma Section. No appointments have been made. Pending the appointment of an Asst. Div. Mgr. for Oklahoma, Asst. Dist. Supts. C. M. Selby, 5BM, 1163 Locust St., Muskogee, Okla., and M. C. Poor, 5EF, 437 West Grand Ave., McAlester, Okla., will report direct to Division Manager. All other Oklahoma appointments have been cancelled.

New Mexico Section, Asst. Div. Mgr., Louis Falconi, 5ZA, Box 421, Roswell, New Mex. Mr. Falconi has not yet announced his appointments.

Mr. Lynn B. Henson, 2012 Main Street, Dallas Texas, WRR, has been appointed Asst. Div. Mgr., in charge of Police Broadcast work for this Division. All correspondence pertaining to police radio broadcasts should be addressed to him.

Mr. Bert E. Gamble, 5JL, 4708 Columbus Ave., has been appointed City Manager of Dallas.

It is desired to have an A.R.R.L. representative in each District, Territory, or City where capable men can be located. Members desiring appointments in the Traffic Department are requested to make application to the Asst. Div. Mgr., in charge of your section. If you do not know exactly which section you are in forward your application to the Div. Mgr. who will forward it to the proper Asst. Div. Mgr.

Recently blank cards were sent to each member in this Division requesting information concerning their stations. This information is for the use of the Div. Mgr.'s office and his various Asst. Div. Mgr.'s. This will in turn be of advantage to each member in the Division. A complete map and card index is being prepared which will show at a glance what cities are represented by an A.R.R.L. station, if that station is both a transmitting and receiving station or if only a receiving station, or if the member living in a certain town has no apparatus. This will enable us to know just where we have stations and where none are to be found. Quite a few of the cards have not been returned. Unless the

cards showing what kind of a set you have are returned our efforts will be for naught. Members representing thirty-six towns have not returned their cards. It is not necessary that I mention the towns, you fellows know if you have failed to return the card. A complete list of towns having an A.R.R.L. station will be published soon. If your town or station is not on the list you will know who to blame.

Reports of Asst. Div. Mgrs. follow:

#### NEW MEXICO SECTION

*Louis Falconi, Asst. Div. Mgr.*

Sorry to say that in spite of much patience and expense with CW, the QRN of this section of the country is still unconquered. Fact is if we had about three stations like WII or WSO situated about 100 miles apart the situation would be solved. Seriously, until some kind of static eliminator (other than the Bessey type) is brought forward that a human can install, New Mexico and Arizona are NIL in summer. But for that matter, I hear fellows in Texas work each other but all they seem to say is "... QRN bad OM pse rpt," etc., etc. We in New Mex. can't even have that pleasure. The A. & M. College at Las Cruces is planning a CW set of considerable size and will be in operation pretty soon. During the past month, a radiophone set was installed by the Roswell Electric Lighting Co. We will be with you when QRN quiets down and traffic begins to move.

#### NORTHERN TEXAS SECTION

*H. P. Heafer, Asst. Div. Mgr.*

Dist. Supt. Neel of Northcentral Texas reports QRN as bad as ever, yet all the good stations are struggling thru with the true A.R.R.L. spirit and getting traffic thru, 335 msg's. having been handled there. 5ZAF leads with 179, with credit also due to 5AO, 5RP, 5QS, 5NS, 5LC, 5ZC, 5EW, 5HZ, 5ZAG, 5NK, 5ZU, 5ZA, 5XJ, and WRR.

5NS is reaching out in grand shape. We will have two good stations at Granbury, 5FI and 5QQ. 5AO is doing good work. 5JX of Comanche has rebuilt and wants your traffic; 5KS and 5RW are also there. 5ZAF, our star station this month, has been doing fine DX work, and 5IQ, also Waco, is another. 5OH of Stamford promises a real station. 5QS at Dublin has his 100% set up and at work. 5IR, Dublin, is putting up two 100 ft. towers and a 20-wire fan. 5QT is not all up yet. 5XJ, Dublin, is still on the job but slightly off this month with but 70 msg's., one of its ops. trying to tune in an OW and Neel busy trying to line up new DX stations. 5RP, Clairette, with his little spark-coil set, handles traffic like a kilowatt.

No reports received from Northeast or Northwest Texas districts.

#### OKLAHOMA SECTION

No report.

#### SOUTHERN TEXAS SECTION

*Alfred P. Daniel, Asst. Div. Mgr.*

This section of the West Gulf Division can report a season of splendid activities. At every hand are stations tervent in their desire to go to it, just as soon as conditions permit, and from the already flattering results obtained by the few who are working in spite of the continued QRN, this is going to be some season.

The Southeast Texas District under H. E. Worthington, 5ZV, Supt., is first to get a sure start; much correspondence is under way, and will be incomplete for a couple of weeks. Mr. Worthington reports a carefully worked out plan whereby the city manager for the Houston Territory will have an assistant, the purpose being to locate outlaws and strays by means of compass loops, and requiring two operators. Daylite communication is daily in progress between Houston and Ft. Worth, Dublin, Hamilton, Arlington, Cuero, Austin, and Goose Creek. 5YI has opened up. 5JI, 5ZV, 5HZ, 5LX, 5ZE, 5ZT, 5DL, and 5ZX are all in daily operation. The latter station has just completed the installation of a seventy-five foot top, cage antenna, being the first one of that idea to make its appearance in Houston. Radiation was increased one-half ampere. This station also has a new sink gap which is giving great satisfaction. 5AE has just installed a sink gap, but is yet having trouble from various sources. He will also have a cage, as will 5CA who is now building. 5NK is experimenting with extremely high note rotary.

The Southcentral Texas District has for its Superintendent Wesley H. Tilley, with headquarters at Austin. 5ZAG is most consistent station at present and is more QSA than last season. 5RA at Cuero is a new and valuable relay station for San Antonio. Mr. Fulk promises to be one of our most dependable operators this season and is a good A.R.R.L. member. 5KV has removed his set to the Rice Institute Dormitory and will be an East Texas ham for the rest of the season.

Very efficient work was done during the Boy Scouts encampment at Waco Springs, 50 miles south of Austin. They had a portable set with them capable of covering about 5 miles with which they relayed traffic to 5YK at New Braunfels, thence to Austin, for telephone distribution. The encampment lasted about ten days until washed out by a cloud burst and during that time 5ZU, 5YK and the camp set handled about 200 messages. Austin has several new stations and there is considerable improvement going on at the different old time stations. 5XB has busted loose and will open the way to better work with the east.

5YK had a poor month, with only 50 msgs., because of receiver trouble and merciless QRM from 60-cycle induction, but the trouble is now being cleared up. A 250-watt CW set will be in operation soon.

The Southwest Texas District was the last to be appointed and correspondence has just been completed with Mr. Ed. Nettleton at Eagle Pass, who will assume the duties of District Supt. for that section. San Antonio will have an Assistant District Superintendent, and we are now awaiting the result of an election whereby the San Antonio Radio Club will offer a suggestion as to their choice of a man to represent them.

All amateurs in that portion of southern Texas, west of and including San Antonio, will please make yourselves known to Mr. Nettleton by letter or card, and stating whether or not you are a member of the A.R.R.L. and what kind of a transmitter and receiving set you own.

#### NORTHWESTERN DIVISION

J. D. Hertz, Mgr.

##### EASTERN SECTION

The past month has seen a vast improvement in the operating efficiency of Trunk Line A. With the decreasing of QRN and the opening of stations who have remodeled, and of new ones, it seems an assured fact that transcontinental trunk A will be open thruout the winter.

7XD at Billings has opened up with a new "coffin" and a Benwood hooked onto a fan antenna, and is sure causing the "cans" to rattle. He has worked sixes, sevens and nines, and is reported QSA from the Pacific coast to Missouri. Our old stand-by 7ZG has been out of the game for some time, but is now on the job again. The only report from Helena is that 7HW is the only station at present getting out. Nor has any report been received from 7EX at Glasgow. We are looking for a big noise from him this winter. At the Asst. Mgr.'s station, 7LY, much less difficulty is now being experienced in working stations to the west, tho eastern stations still continue difficult. QRN has begun to let up considerably, and traffic is getting under way once again.

##### PUGET SOUND SECTION

At Seattle, 7IU has been the busiest station during the past month, handling 147 messages. 7BK and 7IY did practically all of what else was handled in and out. Southbound traffic was handled with Portland until their schedule went into effect there, and since then it has been found just as easy to pass the traffic direct to sixth district stations.

North of Seattle, 7CC and Canadian 5BR are the only stations that have been heard here during the past month, and no

traffic has been handled.

Rumor has it that there will soon be a good station in operation in or around Centralia. Such a station would be a valuable asset to this section of the division.

The Asst. D.M., 7BK, has been visiting in Los Gatos, Calif., sixty miles south of San Francisco, during three weeks of the past month, and while there spent some time pounding brass at 6VX. It is interesting to work the sevens from there. The most important things noticed while there were that:

1. We hear in Seattle practically 90 percent of the sixth district stations that are operating, and many of them just as loud.

2. Portland stations came in with an audibility that was nothing to brag about, and faded nearly out, slowly at times.

3. 7IU of Seattle came in as loud as any of the Portland stations.

4. The peculiar note that all of the stations around Los Angeles have is due to the fact that all of their juice in that part of the country is fifty cycles, and causes a slightly different chord than sixty cycle when using the customary non-synchronous gap.

5. Every one down there stands by from eight until nine P.M. every night for concerts, so we would be doing them a favor by not trying to work them during that period.

6. The inspection service down there is sure to be congratulated on the way conditions are in the air. 6ZE, the assistant inspector, devotes his entire time to the amateurs, and there sure is law and order around San Francisco.

##### IDAHO AND CENTRAL SECTION

7ZS, ex-7BQ, at Pullman, Washington, is on with regularity, and works east and west with consistency. 7YA, the famous Boise high school station, is again on the job. They have a new short wave regenerative receiver, and two new operators, all of which must be broken in before the station can really get down to business.

##### COLUMBIA RIVER AND SOUTHERN SECTION

7HD at Seaside reports that QRN conditions are much improved, and receiving conditions ditto. 7IG has moved back to Portland. 7IJ is not doing anything at present. This leaves only 7SN and 7HD doing any work. Since both of these stations are repairing transmitters nothing is happening, tho both will be on shortly. 7KS has just returned from the east, where he reports having taken in the Chicago Convention on the way back.

At Portland and in Vancouver traffic during the first part of the month moved with regularity in all directions. Early in September a traffic regulation system

was put into effect, and due to a lack of co-operation at a few points traffic has fallen off considerably. Part of this lack of co-operation is on the part of out of town stations who were not informed sufficiently in advance to thoroly think the proposition over and discuss same, and they suddenly ran up against it, and they immediately got "sore". Then a great many of the local stations have just calmly (?) laid their phones aside and turned to other amusements, awaiting for the plan to fall thru, much to the delight of those who have been getting on regularly. The test of time will tell how it will work out.

Those who have been on the job and doing good work have been 7ED, 7ZT, 7BP, 7KB, 7ZB (ex-7DS), and 7QQ in Vancouver.

7JW is coming along fine on his new transmitter. Ex-7ZI, now 7XF, is doing fine work with the 10 watt CW set in use there. Concerts are played at 8 P.M. every night except Friday, which is the local club night.

With the coming of the 59th regiment, Infantry, to Vancouver we now have another telephone in our midst. This is CL-8, who is using a built over Western Electric phone set. He says in building over the set, which was an old one and much in need of repair, he completely took it apart, and on reassembling it he found he had several parts left over, so he left them out, and the fone works better than ever. Hence the saying that simplicity lends greatly to the results a set produces.

An amalgamation of all of the radio clubs of the Northwest is being considered in the western part of the Division, and is meeting with great favor. Plans for bringing about this organization are nearing completion, and in another month there may be much to be said on the subject.

#### CENTRAL DIVISION

R. H. G. Mathews, Mgr.

During September traffic has increased very considerably throughout the Division because of the better weather conditions which have been prevalent. Many of our old spark stations are again on the job and this has added considerably to both the speed and the number of messages handled. CW stations continue to handle traffic as before, the better stations in the Division being equipped with both CW and spark so that transmission can be accomplished during all kinds of weather conditions.

I am sorry to report that our District Superintendent of Wisconsin, Mr. H. J. Burhop, of 9ZY, has been forced to resign his position because of the fact that he is attached to the Navy and has been transferred to Washington, D. C. We will miss Burhop and want to wish him all the success in the world at his new appoint-

ment.

Ben A. Ott, 9ZY, La Crosse, Wisc., has been appointed District Superintendent in his place and we want to request that all Wisconsin stations give Mr. Ott the same hearty co-operation that they gave Mr. Burhop.

M. W. Hutchinson, District Superintendent of Northern Wisconsin, reports the new City Manager of South Bend, F. S. Libbe, 744 N. Allen St., is right on the job and his keynote seems to be co-operation. I wish that more of the fellows showed the same spirit. He reports that several new stations are being erected and that activity, with the coming of fall and the opening of school, has been very much stimulated. The following stations are now licensed: 9BBM, 9BBO, 9BBI, 9BBJ, 9BAC. These stations are all installing half k.w. transmitters. 9AKD has installed a new 5 watt tube set. 9DFK, the St. Joseph Valley Radio Association, will probably re-install its station. A reliable station at Hobart, 9AWZ, completes the route to Chicago. This will solve the difficulty which the district has encountered since it was established. This station reports a total of 48 messages, the only message report turned in. 9DON at Mongo is a new station who has been working over 125 miles with a 32 volt spark coil and Amrad Gap. 9PC, 9UC and 9AKH at Fort Wayne are now all doing good DX work.

At Mr. Hutchinson's request we wish to inform the present personnel in the District of Northern Indiana that some extensive changes in this personnel will be necessary if some reports are not received from the various Assistant District Superintendents and City Managers. Mr. Hutchinson states that but one report was received for September, that from South Bend. This condition is deplorable.

Prof. R. V. Achatz, City Manager of Lafayette, Ind., reports 9YB has done no work and there has been no message traffic in Lafayette for the present month, but is now starting up. H. Budenbom has been designated senior operator and will assist with the scheduling and supervision of the plant.

J. P. Turner, Asst. Dist. Supt. of the Toledo District of Ohio, advises 8GJ has his CW and phone set in operation now, and Bellevue should be heard from at quite a distance. 8ZR has been pounding along better since the convention. He is preparing a circular letter to be sent out over the Toledo District, emphasizing reports, club data, etc., and trusts that it will serve its purpose.

Mr. & Mrs. Candler, Dist. Supts. of Miami Valley District of Ohio, report considerable more activity and interest in handling traffic manifest than has been shown for the past few months. This is due to new stations coming to the front and to improvement in efficiency of some sta-



tions. According to reports received, by far the larger portion of messages were handled this month by stations which were little known before this summer. Most of the stations that were reliable last season are out of commission for one reason or another. 8FT has sold his entire outfit and expects to install a new set besides going into partnership with 8EX. 8IB has not yet returned from his vacation while 8ZL has not yet undergone the necessary repairs for operation. Cincinnati is beginning to wake up again and we have the promise of several dependable stations there for the coming season although not all of them are in operation at the present time. 8EB is assisting in stirring up more enthusiasm there and between 8EB and 8AFS Cincinnati will surely show the rest of the radio world that she is very much alive. Mr. Burkhart, City Manager, seems to have lost all interest in the game.

All operators of stations handling messages are urgently requested to keep a daily record of same and report them to their City Managers or their assistants on the 14th of each month for publication in QST. Those stations located in towns which have no City Manager will please report their messages direct to the District Superintendent at 105 S. Ash St., St. Mary's, Ohio.

Busiest station in the District 8TJ, 78 messages.

Mr. R. D. McCommon, District Superintendent of Eastern Ohio reports QRN still at the "dirty work" although messages are still moving through this District. He has appointed J. D. Bay, of Painesville, Ohio, as an official relay station and connecting link between 8CH and 8WY, and Cleveland. The Western Pennsylvania District has a trunk line which runs through 8CH and 8WY and by sending their Cleveland messages over this line and from either of the two stations to Mr. Bay the messages will be delivered in a much shorter time than heretofore.

Henry Klaus, Supt. of Illinois District, sends in a wonderfully complete and exact report in very readable form. His assistant, N. C. Smith, in Hoopeston, reports things in the eastern section rapidly rounding into shape. 9QH of Danville is reaching out; 9MC is on the job again. Everyone seems to be working on CW and the 8th district will have to step to beat them. Asst. Supt. Nash, of Marshall, reports stations rather few and far between and his own out of commission because of his traveling. No reports received from Asst. Supts. Burke of Galesburg, Bourland of Pontiac, Crane of Eureka, and Foster of Moweaqua. City Manager Niebergall of Mendota makes a good report; he advises 9ACL is getting out fine, 9AMK is assisting him as A.D.S.; several phones and CWs coming up. No reports from City Managers of Elgin, Centralia, and Savanna.

Messerly of Staunton reports CW going big there. Mrs. Hamilton of Forrest is one of our enthusiastic OWs and will keep traffic moving down her way. Gary reports 9AGS, 9UR and 9DFZ of his city, Aurora, in operation OK all summer. Tetrick reports everything dead around Dixon but due for a re-awakening. Silvernail reports ND in Canton but the club being re-organized and 9RH, 9DAY and 9AZF ready for business. Byquist at Bloomington reports 9ABH and 9AHN all ready for fall work. City Managers of Granite City, Peoria and Manhattan report things looking up for real live towns this winter.

Every District Superintendent has reported a lack of activity on the part of the City Managers and official relay stations. A comparatively small number of message reports have been received. In months past the Central Division has led the League in messages handled and we want to continue this during the winter. It is absolutely impossible for the Division Manager to make reports when these are not submitted by the District Superintendents and these men cannot send in complete reports unless every member of their personnel reports to them promptly. We cannot urge too strongly that every relay station operator and City Manager in the Division get a brief report in on the activities of his own city and of others in his vicinity, together with complete message report, to his District Superintendent not later than the 20th of each month.

#### ONTARIO DIVISION

A. H. K. Russell, Mgr.

District No. 1. Bill Carter reports things as going strong in that region. 3DH has been all tuned up for the winter and hopes to poke some terrible oles in the ether; Carter is forwarding along shortly his personnel for the Toronto-Windsor chain. Mr.



William Gray in Chatham has his DeForest set going strong and is reported QSA in Detroit and Windsor. London is very backward still, but a ½ K.W. station is being installed at Y.M.C.A. there, which inspires hope of better things in that city. 3GA and 3EH, both of Windsor, and 3KG

of Ingersoll are all doing excellent transmitting and will be of great help this winter.

Gowan from District No. 2, reports 3BA in Brantford has been doing great DX work lately, but is going to close down shortly to put up two 76' masts and will then be bigger and better than ever. 3CH in Brantford has secured a definite source of 500 volt d.c. and is going to tickle the air with some CW this fall and show 3BA how good CW is. 3PM in Brantford is overhauling and D.S. wants to know why he didn't do it in the QRN season.

Gowan tells us that he expects an O.W. to open up in Stratford, thus putting it over the rest of the division. Miss Whitmore is the lady's name and she is installing a transmitter soon, being already an expert telegrapher.

3KA in Guelph and 3BI in Galt both have new masts and will soon be heard from.

3DS is going to make make the welkin ring with a 50 watt tube set before Thanksgiving Day, he says. What the rest of the division want to know is whether he is going to use 25 cycles on the plate. 3QJ in Kitchener is now using a tin roof for a counterpoise, increasing the radiation thereby 75%. Several others are thinking of insulating their garages for the same purpose, but say that the Fords inside cause the spark to sound ragged when these garages are used.

Gowan says he never hears from Dedrick in Owen Sound, etc., and wants all in the north part of his district to let him have reports from them.

District No. 3 is exceedingly lively, with plenty of relaying going on between Toronto stations and the U. S. 3GE is installing his new "sink" gap just as soon as he gets a condenser to hold it, and 3EI is also using one. The latter would get much better DX working if he would improve his sending, which is terrible. 9AL has taken his set down and is moving to a new house, but hopes to be in operation again by the end of October. 9AW broke some kind of record on Sept. 25th when he talked to 1TS in Bristol, Conn., on radio-telephone using only one Type ES-9 Ediswan tube; at the time 1TS was using a single receiving bulb.

District No. 4 under Rogers, 3BP, has a new development. He reports that due to heavy QRM in the region of Pennsylvania and Chicago and good results at Newmarket, he is able to clear traffic to and from New York and Chicago direct. He hopes to clear traffic for Quebec through 2BF in Montreal, but has not yet got in touch, though 2BF is copied well in Toronto.

No signals from Western Ontario have been copied and no messages handled. Rogers says he has to keep the natives

away from his aerial with a shotgun, they are so curious. He also dug up a curiosity in an amateur whose DX range was 3½ miles, using a coherer. Rogers says that when 3BP opens up the decoherer refuses to decohere.



Donnelly of District No. 5 paid a visit to the D.M. and reports Kingston as fairly dead for the present and the only hope for DX from there lying in the CW which he hopes to supply.

No report has been received from District No. 6, but Caton in Ottawa writes that radio save Government experiment is pretty dead in that town, even though they are one of the few cities in Ontario who are allowed 200 meters the year 'round for general amateur stations.

Reported messages, 109, of which 3BP handled 83.

#### PACIFIC DIVISION

E. G. Arnold, Asst. Mgr.

The terrific summer season, noted in this locality, has practically disappeared as far as radio is concerned.

We are very glad to report that from all present indications we are about to have one of the most wonderful winter seasons that we have ever had on this coast. Traffic has been moving steadily for the past few weeks. Every one is gaining confidence as favorable conditions appear.

To the north we still have our old friends 6ZX, 6IC and many others who are handling a heavy traffic schedule. Things are to be handled this season in a more vigorous and business-like way, than they have been in the past. Almost all of the heavy traffic will be routed and scheduled. In the Bay District we have 6ZK, 6CH, 6AS and 6OC. We have lost 6ZR and 6ZAA, both having moved to Los Angeles where they will unite and sign 6ZR. 6VX, 6TV, 6HC, 6PJ and many others are pounding in great style. To the south work is being handled in a more business-like and sane manner, due to the wonderful manner in which the air is being handled thru the efforts of the Southern Calif. Radio Association.

Those seeming to represent the south are 6KD, 6ALU, 6ER. We hope to hear our friend 6JD on the air again shortly.

We also have ex-8GX who is now signing 6AWP.

Now fellows, what we want is co-operation. Get in and send us your message reports, and the time that it is possible for you to work. We want all of our A.R.R.L. stations to be working on schedule. Many of our members are doing that at the present time. Let's all get together and send in those reports and give our officers some material on which to base their monthly reports. It is impossible for them to put our division on the map unless you do this.

#### DELTA DIVISION J. M. Clayton, Mgr.

Due to the gradual decline of static the interest in the Division has been going up by leaps and bounds. Clear nights are appearing much more frequently now and considerable work is being done by most all the stations in the division.

It may be well to mention that practically every DX station in the division has been remodeled this summer, which leads us to predict some record breaking DX work from the bunch down here this winter. Nearly all of last year's star DX stations are now operating, quite some months ahead of last season's schedule. Those who are not in actual operation promise to open up soon. A gang of new material has shown up and all in all we are all getting ready for a big winter.

W. C. Hutcheson, District Superintendent of Tennessee, reports interest running high thruout his district. At Knoxville, the Knoxville Radio Club was recently organized by the men there and it has an enrollment of fifty. At present Knoxville boasts of six 1 k.w. transmitters with two CW sets being installed. Chattanooga amateurs are beginning to show activity and are planning to organize a radio club within a short time. At Nashville, the Nashville Radio Club is being re-organized. 5FV there is reaching out in fine shape now and makes considerable racket everywhere south of the North Pole. 5DA is going fine as usual both on the old spark-er remodeled into a sink-er, and a 50 watt tube set. The tube set is a late addition but DA seems to have her going fine. No message report received from Tennessee. We know lots have gone thru there. (Hw abt gettin 'em to report msgs., DA?) 5EK at Memphis failed to make a report. EK is on the air every night doing good work. All in all the Tennessee report is a very good one. The organization spirit is hitting the high mark under the able leadership of Hutcheson who is to be commended for having stirred up so much interest.

Mr. Barrow, D.S. of Louisiana, reports Louisiana conditions on the up-hill climb. Quite a few new stations heard from. Five active stations have been reported by Chas. P. Johannsen of New Orleans as operating in that City. New Orleans is still without a City Manager but Mr. Barrow is negotiating with New Orleans men and expects to have made the appointment before next month. There are several good stations in New Orleans whose owners are not members of the League (hw abt it AU and GK?). Mr. Pullen reports that 5ZAB will be louder than ever this year. ZAB's have completely rebuilt the station and already are coming in at Headquarters in fine shape. Thibodaux High School is still without a permanent operator. As soon as one is secured 5YL will be among the best stations in the division. 5ZAC ex-5EA is hard at work on re-installing the set, also a bit harder at work making the new 100 watt tube set put out the goods. No message report from Louisiana.

5ZP, A.D.M. deBen is back at New Orleans and is working the set on a temporary aerial. ZP will be with us on the air in full force in a very short while. His doc reports his recovery about complete, so we aren't worrying about the radio part of his existence.

5JD, C.M. at Little Rock is hard at work getting more ground into the ground. JD is reaching out all right now and has worked quite a few stations this month. No msgs. handled. He will be in full swing in another month and ready for all of 'em.

5ZL, the D.M., has completely rehased the station and is working spark alone with non-sink gap. Reaching out pretty fair now. Msgs. handled nine (hi).

The Quiet Hours period was formally adopted on the first of October by this Division. We must have the co-operation of all the DX men here to make it a success. It's a fine chance for us all to get some great DX records both receiving and transmitting so you all are urged to stick to the Quiet Hours and spread the dope around on them. Also don't forget that an accurate log must be kept of all transmissions as well as receptions if we are to reap any good from the QRX period.

#### DAKOTA DIVISION Boyd Phelps, Mgr.

Traffic is again moving in considerable quantity. We have with us this year many new and most of our old stand-bys. The prospects are better than ever before for connecting up with the numerous towns where heretofore communication was not established and msgs. had to be mailed. Not a few of the stations that last year dabbled with CW are now dabbling with spark and handling traffic on CW. 9XI,

9ZT, 9AJP, and 9YAC all bid fair to be leaders in CW this season. 9HM—like friend Matty—still thinks CW is a laboratory experiment.

Co-operation with the Police Department is being carried as far as possible to all parts of the Division. To better organize this work Mr. A. C. Andersen has been appointed Assistant Division Mgr. and given charge of all matters connected with police broadcasts. 9ZT located as it is in the same building with the Minneapolis Police and County Sheriff will broadcast reports for this territory on 375 meters using 100 watt phone and CW. The time has not been definitely set but will in all probability be just before or after 9 P.M. Complete arrangements have not been made with other stations but it is expected at this time that 9YAC, 9ZX, and 9AIF will also broadcast while all receiving stations are expected to phone whatever they copy to their local police authorities.

In North Dakota 9ZX operated by 9WU and 9EE is our best bet for the Northern Route in that territory. 9YAF at Pembina has been off the job all summer but is now our best link to Winnipeg, Canada. Due to absence of Mr. Leavenworth, Dist. Supt., little has been heard concerning the new stations being developed in North Dakota.

Mr. Gjelhaug, 9ZC, reports everything picking up in the District of Northern Minnesota. Wm. D. Wagner, City Mgr. of Duluth, says that for various reasons he does not believe there will be any regular DX stations in Duluth so most of the traffic for that city will have to go to 9YAC of Superior. 9YAC is operated by Mr. W. C. Bridges, Asst. D.S., and is about the best for handling traffic on either spark or CW from the Twin Ports.



Southern Minnesota has some new stations outside of the Twin Cities. In many of the towns where the power supply is insufficient the amateurs have turned to CW and eliminated blinking lights. We hope 9XT of Collegeville will be able to get out consistently this year. 9AMB, St. Olaf's College, Northfield, Minn., now has the call 9YAJ and under the leadership of Herbert Skifter the prospects look very

favorable. Rumors have been drifting in regarding 5 and 10 watt CW sets in many small towns where aerials could not be found during the summer. In Minneapolis a bang-up good radio club has been started which will undoubtedly include several hundred local amateurs. Because of the large delegation that appeared at the first meeting from St. Paul it was decided to call it the Twin City Radio Club. Many events are scheduled for the year which promise much for the members.

N. H. Jensen, Box 894, Sioux Falls, S. D. has received some reward for his persistent work on his district. He takes great pleasure in sending in another application for affiliation—this time it is the Yankton Radio Club. This club operates the Yankton College station 9YAK and has been tearing up the ether for many a mile with QSA sigs. Edgar Freeman, 9AYW of Elk Point, together with several others from about the state will be at the U. of S. D. this winter operating at 9APC. Mr. Harmegnies will not be at 9YW, Rapid City, this winter but his place will be filled by Oren Lamb of Phillip, S. D. 9AVZ at Pierre will be operated by Sherman Gregory and possibly Orville Wheelon if the latter lad has by this time recovered from 9ZJ's cigars sampled at the Convention. In Sioux Falls 9AIG, 9AIF, and 9DKQ have added 85 foot masts and the general overhauling given these three stations looks like they will be heard. The Sioux Falls Radio Club (affiliated) is going full blast again with the old pep renewed and overflowing. They plan on a get-together of all amateurs in South Dakota and vicinity sometime just after Xmas. More power to you, Gang. (Other Dist. Supts. pse note: The natives of S. D. have been turning in more memberships than any other district. Hereafter your district will be rated according to the number of new members or renewals obtained during each month.)

#### ROANOKE DIVISION

W. T. Gravely, Mgr.

Reported by A. S. Clarke, Traffic Assistant

Things are opening up in good shape throughout the division. Static has shown signs of abatement and traffic is going through every night, both by spark and C.W. The division expects to hang up some new records in number of messages handled this season.

In West Virginia 8SP, 8JE, 8AFD, 8AQV, and 8EF are handling the traffic in good shape. 8SP's spark is as far-reaching as ever, and he is seldom off the set. 8AFD, although fairly new at the game is handling traffic and is heard far and wide.

In Southwest Virginia things are still in the formative stage, and as yet no stations are handling traffic. V.P.I. and V.M.I. should have good stations this



winter and also Roanoke College. Several C.W. sets are in course of construction in this section and it is hoped that eventually somebody will be able to handle traffic for that territory. Stations in Lynchburg, please report yourselves to District Supt. Wohlford, 656 Day Ave., Roanoke, and get in line with the rest of the bunch.

Danville has two good stations which are handling considerable traffic now, and will handle more as winter comes on. It is planned to have either 3BZ or 3AEV on watch every night this season, and Danville will act as clearing house for the south.

Richmond has several C.W. sets which are being heard, and communication has been established with Petersburg by phone. 3AOK has phone and C.W. 3ZP has C.W. under construction and 3HO also.

Norfolk section hasn't as yet struck its stride. Old 3GO now 3XY hasn't opened up, neither has 3EN. Old 3VV now 3ZZ is handling traffic with his C.W. and 3EZ is handling some also. The following additional stations will be in line for this winter: 3ACE, 3ACT, 3ACZ, 3MM, and 3ACK. XF1 will be a big help with a 1 k.w. C.W.

The call of 3BGS has been assigned to J. P. Hyde, Bristow, Va. 3BID has been assigned to Groves of Brooke, Va. All hands will hear with pleasure that their old friend Groves is now contemplating the installation of a C.W. set after being all these years without any means of transmission. If he goes into the transmitting end of the game as thoroughly as he has the receiving, look out for some new developments.

The situation in N. C. remains unsatisfactory. There are some good stations there, but they have not as yet been knitted into an efficient organization.

Total reported messages handled, 205.

#### ALASKA DIVISION Roy Anderson, Mgr.

Six months ago Alaska boasted about one A.R.R.L. member, but we're growing fast (!?) for we now have half a dozen members. Every one is working for the bettering of the other's condition and each one is more than anxious to open a relay route to the States.

George Sturley (7BJ) has been in Alaska this summer as ship operator and he has installed a set in Chignik which is to be operated by Ivor Wallin, a permanent resident. Both are more than anxious to be instrumental in opening a relay route south into the states.

Leon C. Grove, Principal of the Kenai Schools, is also an active member. In his letter he said: "I just received your letter re American Radio Relay League. In am certainly back of any such organization and will do anything in my power to

further it." He also says that there is lively talk that may lead to a station or two in Anchorage and also one in Seldovia. Mr. Grove has a splendid location on a level area of hundreds of square miles and is also on the water's edge. With a good set he should be able to make some records.



Everyone in the states is also anxious to help some of us hams raise a fuss thru the ether. Royal Mumford of 7ZJ is one of the most enthusiastic. In a recent letter he gave some very interesting and helpful information and if no Alaskan hams are heard down that way, it's all their own fault.

Mr. McCue, 7IP, has a good regenerative receiver with a two-step amplifier and it won't be long before he has a 15 watt C.W. set going and here's hoping he's heard down in what is sometimes called God's Country.

Well, there's spirit in the Alaskan hams, all that troubles them is the mail service. Chignik, once a month, sometimes; Kenai, once every two weeks; Craig, once every week or two. Ketchikan is the only one that can't kick much.

#### MIDWEST DIVISION L. A. Benson, Mgr.

Conditions in the Midwest Division for the last month have been most excellent. Many new stations are installing spark and C.W., and traffic is beginning to move in all directions.

#### DISTRICT OF KANSAS

9SZ of Council Grove has quit the game for a time and is selling his entire outfit. 9EL is working daylight trick making it impossible to be on late at night for about a month.

9PS, Asst. Dist. Supt. of Kansas advises not much traffic handled through Wichita during month of August account of excessive QRN but promises us many good stations to handle traffic this season including 9AUO, 9KA, 9PS, 9APY, 9DFL and 9DZE. 9ABY has been appointed City Mgr. of Hutchinson, Kas., and reports many good stations will be in operation there this season. 9AEG, Asst. Dist. Supt., at Eldorado, reports two or three times as many stations as last year. 9DHB, Elk

City, sold his 1 K.W. to 9DUN of Caney, who promises to have it in operation soon. 9DXD at Caney has just completed  $\frac{1}{2}$  K.W. set and is getting good results out of it.

#### DISTRICT OF IOWA

P. A. Stover, 9JA, Supt., reports the gang all back from the Convention and going strong. About 125 msg. handled during Sept. According to plan the state is being reorganized and new officers being appointed. These officers are taking up the work with an enthusiasm that is far beyond my fondest expectations. The work of Mr. Bloemer of Burlington is especially to be commended. The state has been divided into sections with officers in charge as follows:

Asst. Dist. Supt. for Iowa at large, Carl Menzer, 213 E. Market, Iowa City, Iowa, 9YA.

Asst. Dist. Supt. for Southern Iowa, Kermit Bloomer, 430 Harrison Ave., Burlington, Iowa, 9KQ.

Asst. Dist. Supt. for Eastern Iowa, Frank Breene, 419 No. Clinton St., Iowa City, Iowa.

Asst. Dist. Supt. for Northern Iowa, L. S. Stenerson, Ames, Iowa, 9JN.

Asst. Dist. Supt. for Western Iowa, W. Harlan Gass, Sheandoah, Iowa, 9AEQ.



HERE ARE FOR YOU AND THE A.R.R.L. MAPS SHOWING THE DIVISIONS OF THE STATE, SHOWING ORGANIZATION DISTRICTS, AND THE STATIONS AND PUBLICATIONS IN EACH DISTRICT.

Mr. Carl Menzer, 9YA, as Asst. Supt. for the State succeeds Mr. Breene, 9JL, who has taken the Eastern Iowa Division. After Sept. 25th, all mail intended for the Superintendent should be addressed to 213 E. Market Street, Iowa City, Iowa. As will be noted the address of the Asst. Supt. and the Supt. are the same. It was deemed advisable to have the same office so that the work could be more evenly divided and better results therefore obtained. Each of the Division Supts. is organizing his territory and wants the names and addresses of all amateurs in his territory, so it therefore behooves each amateur to write to his immediate Supt. and give him full details of his station and his whereabouts. This is especially requested of the operators with "D" calls as no list of these is obtainable at this time.

The Iowa Radio Relay League has become affiliated with the A.R.R.L. and its purpose will be to promote the general welfare of the citizen operators in the State. Full information can be obtained

from Paul A. Young, Coe College, Cedar Rapids, Iowa.

We would like to see Des Moines wake up and give us a little noise. There are perhaps two stations there that reach out but we would like to hear from some of the clubs, and see if we can't find someone who is alive to hold down a City Manager's job.

#### DISTRICT OF NEBRASKA

During the past month the bulk of the traffic through Omaha has been handled by 9VE, 9HT, 9EW, and 9ALK.

Lincoln at last has several efficient stations in operation and regularly handles traffic, going via 9DNC, 9DQE, 9DPF, 9DTU, and 9DWF.

9VE of Omaha deserves great credit for his phone and CW work during the past few months. He has turned completely to CW and is DXing regularly on a couple of five watt tubes. He reports working 5ZA on twenty watts.

From the looks of things, Bullis, 9SC, the spark wizard of Nebraska, is due to split the air this winter as he has completed his radio shack and is installing his outfit at present. He held all the pre-war DX records for Nebraska.

#### DISTRICT OF MISSOURI

Altho static has been both heavy and steady during the past month, the fellows are again getting on the air in increasing numbers each night. All amateurs in the district are showing a large amount of interest both in relay work and club activities. The southern half of this district is showing life. Daylight relays to cities 200 miles distant are now quite common and small 5 and 10 watt tube sets that work from 50 to 100 miles in the daytime are aiding greatly in this work. C.W. sets, however, are not the only stations doing good work here. Any of you who think CW is going to replace the good old spark as a distance-getter or as a reliable means of relaying traffic have only to listen in on any kind of a night out here and eight out of ten stations working DX and working consistently are spark.

Club activities in Kansas City and vicinity are now promising to outdo all that has ever been attempted in the past. Lately the members of the Old Missouri Valley Radio Association have become divided among themselves but now efforts are being made to reorganize all existing clubs into one strong central club.

Interest in the St. Joseph territory is not very great now for some reason, although great things have been done up there in the past and will be done in the future.

9HO, Asst. District Supt., is now at 9YM. At present no station has been found in Sedalia to take his place although

there are a number of stations located there. 9AVK at Holden is on regularly and doing good daylight work. 9ASD and 9AQR, both of Kansas City have worked over a hundred miles on 5 watt tube sets. 9XAB sends out market reports daily on voice. 9AXJ sends out concerts quite regularly. 9ZH is on daily and will QSR after his regular schedule. OW's are already becoming quite common in this district.

#### EAST GULF DIVISION

E. H. Merritt, Mgr.

We have some very good news from South Carolina this month. 4EG has been pushing things in the state and is getting results. He reports Greenwood has formed a club of about fifteen members and is building a club set. They are all new in the game yet and are trying to get started. Give 'em help and encouragement, fellows.

Greenville has a club of thirteen members. 4HR and 4IB are operating CW sets there now. 4HR is George Wrigley and 4IB is Miss Cella Boren. Get that last? A Y.L. in the Division now, fellows, and from all reports coming in, the D.M. should take a trip over and join her radio class. She holds a first grade license and can copy 35 per., so let's get in touch with her by radio and put Greenville on the map. Spartanburg has come across with one station and will help out too. The line from Spartanburg to Woodruff should be open now.

4EG, W. C. Etheredge of Woodruff, will be on the line again soon. Three more stations are under construction in Woodruff.

Reports from Alabama and Florida are missing.

Report for Georgia, by B. W. Benning, D.S. follows:

Savannah: 4GL, the best relay station in the south, has averaged 95 msgs a month for the past 3 months and for this month reports 155 msgs handled. "Atta Boy," Hill! 4BY's new station using 250 watts CW and 500 watts spark will soon be on the air, and he is also overhauling the old 500 cycle set. 4FF, using 30 watts, is trying to show 4GL how it is done. 4XB with same set as last year and 4XB1 with 400 watts CW, ICW and fone will be in operation.

Atlanta and vicinity: Not a single msg thru Atlanta this month. Everybody is remodeling. 4XC junked his set after the Convention and is trying to build a spark set and 250 watt CW set with a zero power factor. 4AU, 4CG, 4ZF (ex-4EK) and 4FJ are all working on their sparks and expect to be on the air by October. 4EB in Palmetto, Ga., has a 20 watt fone set in operation and should connect Atlanta and LaGrange this winter. 4HB in College

Park, Ga., is also using a 20 watt fone set and will have 100 watts soon. 4CO has done fine work on 10 watts CW in working 2AJF and 4GL.

Macon: 4BK reports 4 msgs for the month. He has been using a small 10 watt set and has had no trouble reaching up to 600 miles with it. A 50 watt set will be installed shortly.

La Grange: Both 4DT and 4DY have entered Georgia Tech in Atlanta, so the only station left for traffic is 4DH. 4BA expects to be able to help him out soon. Msgs handled: 4DT-6, 4DH-11.

Rome: 4BQ is still reaching over the country with his old sink rock crusher and expects to have a 100 watt CW set soon. If his O.W. would let him operate as long as he wanted to he would sure handle some traffic. Hi.

Midville: 4FD reports 16 msgs. for the month and says that he has at last built a condenser that will hold his 1 k.w. No report from 4GN.

Athens: No report from OM Pope. S'matter, 4AG?

Total reported msgs. for month, 182. Busiest station, 4GL—155 msgs.

#### IMPROVING THE C.W. GROUND SYSTEM

(Continued from page 26)

radiation will, in many cases, be doubled, especially in cases where a good ground connection is available. Very good results should be obtained even if the ground system is not directly under the antenna, as for example a water-main ground.

Figure 1 is a diagram of connections of the apparatus used at 2BML. There are no special features excepting the combination of counterpoise and ground described above. A master oscillator is used to keep the frequency as constant as possible. It is essential to make the condensers in the ground and counterpoise leads large in comparison with the counterpoise and antenna capacities. The condenser in the counterpoise lead is simply a stopping condenser to keep the plate voltage off the counterpoise. Two 250-watt Radiotrons are used. One tube is used as the oscillator and the other as the modulator.

The antenna current is six to eight amperes, depending upon the voltage of the local 60-cycle supply. The plate voltage is 2,000, using full wave rectification with two Kenotrons. The smoothing condenser is 1½ M.F., but is not large enough to smooth out the 60-cycle ripple, so the modulation is not particularly good and is seldom used, although it has been heard over distances of 300 to 400 miles several times. The Radiotrons draw as much as 600 watts or more from the condensers, so a very large condenser would be re-

(Concluded on page 45)



**AFFILIATED CLUBS—Help! Help!** This department is being conducted by F. H. Schnell. Give me some information as to what your club is doing, something interesting that will help other clubs. Let us make this department one of the real departments of interest to all radio amateurs. Send in your stunts that have proved successful. Send in good snappy photos. You want representation and we want facts concerning clubs. We want to increase the prestige of our Affiliated Clubs. We will help our Affiliated Clubs. Is your club one of the live ones? If so, we will hear from you. If it is a dead one, we will try to liven it up.

hind the tables ready to answer all questions pertaining to certain pieces of apparatus. In the morning, the spark transmitter was in order and among those answering questions was Irving Vermilya, 1ZE, who upholds the spark. Others were answering questions on receivers, etc. In the afternoon C.W. held the attention of the gang while E. W. Whittier, K. B. Warner and others answered questions on C.W. transmitters, and be it said old "VN" was very much interested. Miss Eunice Randall, F. C. Estey, H. J. Tyzzer and C. G. Smith took turns explaining the new S-tube invented by Mr. Smith. A small set was in operation using two S-tubes as



**SOUTH DAKOTA RADIO CONVENTION** will be held in Sioux Falls on December 28th and 29th under the supervision of the local Y.M.C.A. Radio Club. See details in December QST.

**THE PORTLAND CONVENTION**, representing the Northern Section of the New England Division, was attended by three hundred amateurs. The date was September 10th. A radical change of program was the idea of Mr. H.W. Castner, Asst. Div. Mgr., who engineered the affair singled-handed in a most amazing manner. Instead of the usual ten-hour program of speakers, Mr. Castner decided that the amateurs in that part of the country were looking for information, and he was going to see that they got it. Accordingly large tables were placed in the Auditorium of the City Hall. The tables were jammed full of apparatus furnished by manufacturers and competent practical amateurs stood be-

rectifiers of A.C. for plate supply of a C.W. transmitter. C. D. Tuska explained the operation of regenerative tuners.

In the afternoon a concert was given on Portland's magnificent municipal pipe-organ, second largest in the world, and was highly appreciated by everyone. At 7:00 P.M. was the banquet at which addresses were made by our President, Mr. H. P. Maxim; K. B. Warner, Secretary; F. H. Schnell, Traffic Manager; and C. D. Tuska. In the evening an auction was held and pieces of apparatus were raffled off after the program of entertainment.

The whole success of such a splendid convention was due to the work of one man. That man is H. W. Castner and to him belongs the full credit. Not a minute of the entire day "dragged along", as Mr. Castner carried out his plans to the letter and followed his schedules to the minute, which ended near midnight. Without doubt a world of good was accomplished for



the amateurs in that section, and we will see it reflected in their work this winter.

**GREATER BOSTON SPARK COIL CLUB** desires to hear from amateurs using spark coils, for the purpose of forming a spark coil relay chain in and around Boston. Relay work will be carried on during a period set aside for that purpose, which is 7:00 to 8:00 P.M. Inquiries should be sent to V. E. Fuller, 24 Pearl St., Dorchester 25, Mass.

**NORWICH (CONN.) RADIO CLUB** extends a hearty welcome to all visitors. Meetings are held Thursday nights in Room 313, Thayer Bldg., at 8:00 P.M. N. E. Soules, Sec., will be glad to correspond with secretaries of other clubs.

**RADIO CLUB OF JAMACIA** held its annual election of officers at its meeting October 1st. J. V. Cunningham, Sec., 44 Kingston Road, Jamaica, L. I., says that considerable activity is evident in the installation of C.W. transmitters in place of the old sparks. Meetings are held every Saturday at 8:00 P.M.

**PHILADELPHIA AMATEUR RADIO ASSOCIATION** held its first regular meeting of the season at its club rooms, 1200 North Road, on September 19th. Two interesting papers were read, one by Mr. P. Jessup on choke coil amplification, and the other by Mr. J. E. Delp, Jr. on C.W. parts. The paper by Mr. Jessup explained the construction of amplifiers of this type in detail and created a great amount of interest in the subject.

**RADIO ASSOCIATION OF GREATER NEW YORK** has published its first issue of "The Modulator", a snappy little paper with several very good departments. If the first issue is an indication of what the following issues are to be, "The Modulator" will make many friends. Mr. W. F. Crosby is editor and has made an appeal to all amateurs for the support of the paper. In the first issue starts the description of "A small C.W. set for amateurs", by L. M. Cockaday and no further comments are necessary to anything that is done by Mr. Cockaday, as his specifications are thoroughly reliable.

**EXECUTIVE RADIO COUNCIL OF THE SECOND DISTRICT** has adopted Traffic Rules and Regulations which are given herewith—something this district needs.

#### Traffic Rules and Regulations Standard Time

1. 7 A.M. to 7 P.M.—*Free Air*. (For all forms of transmission, including testing.)
2. 7 P.M. to 9:50 P.M.—*Local trans-*

*mission only*. (If high-powered stations desire to transmit during this period the input of transmitter must be reduced so as not to exceed  $\frac{1}{4}$  K.W. Testing by any station during this period will be done only on last ten minutes of each half hour.—20 to 30 minutes or 50 to 60 minutes, except last ten minute period.)

3. 10:10 P.M. to 1 A.M.—*Long Distance Traffic Only*. Only such stations as have been designated by the Traffic Supervisor as long distance traffic stations will transmit during this period.

4. 1 A.M. to 7 P.M.—*Free Air for Distance Work* of all kinds.

5. The above includes all classes of stations—Spark, C.W., I.C.W., and Radiophone.

6. Radiophone broadcasting of speech and music is to stop at 9:50 P.M.

7. All work by general or restricted amateur stations will be done by wave lengths not exceeding 200 meters, and with a proper legal decrement.

8. All stations must be operated on reduced power whenever possible to avoid unnecessary interference.

9. Spark stations in calling will transmit the call of the station wanted three times and sign off three times—no more—with two minute intervals between calls.

Example—2BK, 2BK, 2BK de 2JU, 2JU, 2JU.

If a station called does not answer after having been called three separate times, do not repeat the call for 15 minutes. In answering calls, make the call letters of the station which has called three times, sign the letters of the station called once, and end with K.

Example—2JU, 2JU, 2JU de 2BK—K.

This procedure should be followed both in long-distance and local work. C.W. stations when calling other stations are allowed a double-length call. Call three times sign three times, call three times, sign three times.

10. No station should transmit unless the operator is sure other near-by stations are "clear".

11. Instruction for routing traffic will be issued by the Traffic Supervisor according to conditions; but as a general rule traffic should be relayed to the stations best equipped or situated to handle it.

12. The International abbreviations must be used whenever possible. Conversations should be brief.

**LA CROSSE RADIO CLUB** is installing a new station. The transmitter will be one kilowatt spark (better reconsider and put in C.W. at the start. It will come sooner or later—why not now?—T.M.) Antenna will be four-wire T type 90 feet long and 70 feet high with four wire cage lead-in. Receiving set is C.R.L. Regenerator with detector and two-stage amplifier.

A watch will be kept every night from 8:00 to midnight, and until 6:00 on Saturday and Sunday mornings.

**RADIO TRAFFIC ASSOCIATION** (Brooklyn) bulletins have been received again after a suspended period of some months. These little papers are always welcome and in them we find some mighty interesting reading matter.

**DALLAS RADIO KLUB** would take first prize for being the snappiest radio club in the country if we had such a prize.

Just get some of these ideas if you want to instill enthusiasm into your members. Mr. P. T. Bennett, their secretary, writes: "We recently amended the constitution to take care of all the Friday nights of the month so that we could have time to get in our work.

"This summer we inaugurated a novel and entirely new system by which we were enabled to keep up the interest during the hot summer days. This idea sprang from a similar one used in the Dallas Electric Club, which we modified to suit our needs. At the Dallas Electric Club Monday luncheons every one is given a card to sign. These cards are collected, shuffled and one drawn. To the man whose name is on this card a prize is given, which is usually donated by some electric company or store. This is the basic idea that we have taken for use in our club. We have four cards drawn, tho, instead of one. The first is the prize card, and the other three are a committee that has charge of the entertainment for the next meeting. Here's where we give 'em all something to do.

"Our first trial of this new scheme was made July 8th. The prize was an amplifying tube, and as luck would have it, it was won by a young squirt who was badly in need of it and didn't have the necessary wherewithal to purchase one. The committee members who were drawn were rather young but with a little help on the side from some of the older members, presented a very good program. A talk describing the Gamewell System for fire and police signalling used by the City of Dallas was given. Code practice was called for but some one, smelling a Senegambian in the woodpile, got up and talked the whole club into voting it down. A hush of expectancy settled over the club after this burst of oratory against holding code practice on such a hot nite, especially since the moon was shining out on the lawn, and with the help of a few men the large code practice tables were taken outdoors and a large load of watermelons that had been in cold storage for 48 hours was served. The feast ended with a contest between the C.W. of 5CF and 5JG, J. "Suds" Dorsa, trying to see who could eat a quarter of melon the quickest. It would have been a

tie had not Dorsa inhaled his part of the melon. ———

"By the next meeting the toxin had begun its work and several new faces were on hand, some of them ancient club members who were lured out on the prospect of winning the prize and getting something to eat, also a few visitors. This nite two contests were pulled, one on copying the fastest and cleanest, for licensed operators, and the other to draw a diagram of a standard amateur sending and receiving set and briefly explain the action of the various instruments. The papers were collected and notice given that announcement of the prizes would be made next meeting. The committee then gave the president the wink, and taking two members with them filed out of the room while the president with fluent oratory held the club for some fifteen minutes till the committee invited them all out into the hall where they had prepared six gallons of fruit punch, sans spike.

"Things had been growing better all along and on the nite of July 29th they took a header for deep water. We had a Secretary of the Hunt County Y.M.C.A. down to visit us and he started the program off with an excellent talk on co-operation. After his talk the committee appointed two men to choose sides for an old fashioned spelling match. The words to be spelled were common ones used in the radio art. However, before the spelling match started the Y man had the gang go thru a few stunts. After some thirty minutes of whooping and yelling at the crazy antics pulled the bunch was finally lined up for the grand finale. Announcement was made before that a prize would be given to the fellow who spelled down all adversaries; in fact a large box was placed on the table in full sight of all, with a hint that it might be the coveted article. The match began to wax hot and in fifteen minutes one side had been whittled down till it only had one man. There were four on the other and to make things fair this man was moved over to the other side and all hands were to spell for themselves in order to get it down to one man. The prize sure enough was in the large box but it was only a QST and not a large precious something made out of gold or silver. As the winner was a member of the A.R.R.L. the QST was donated to a visitor.

"After the spelling match we were again invited out into the hall where the committee had prepared a feast of ice cream served out in cones. For once in our lives we got all the ice cream cones we could eat.

"The prizes of the other meeting were announced at this one and were: a rubber contact key, given for the best copying, to 5CG, Marion Apple, McKinney, Texas, who visited us that nite (this key has been photographed and the photograph placed

among the archives of the club), and a tube given for the best description of a station and the functions of the various parts.

"We believe that we have found the means that will open Sesame for the club. The surest way to keep this interest up all over the country is to pull something unexpected at each meeting. Keep 'em on the jump. It's the mysteriousness of the thing that they like; they're curious to know what is around the corner; that is why they are afraid to miss a meeting."

#### SPRINGFIELD RADIO ASSN.

The Springfield (Mass.) Radio Assn. recently conducted experiments looking to a solving of the mystery of why signals from Worcester and Southbridge are not satisfactorily received in their city. A regenerator and detector-twostep were set up in an auto having a 10-wire aerial hung about it, and driven east from Springfield while stations in Southbridge and Palmer transmitted as previously agreed. No signals were heard until the car had passed over a hill in the Wilbraham range, some eight miles out from Springfield, but from that point on no difficulty was experienced. Iron ore in the hill is thought to be responsible for the shielding.

#### TRI-STATE RADIO ASSN.

The Tri-State Assn. of Cincinnati is now in its new quarters at 2421 Gilbert Ave. and is holding regular meetings every second Friday to which visitors are invited. A  $\frac{1}{2}$  k.w. spark and a C.W. set are being installed. Any amateur interested is invited to drop down to their shack or write P. J. Poland, Cor. Secy., 347 W. McMillan St., Cincinnati, radio 8AQT.

#### COLLEGEVILLE, (PA.) RADIO CLUB

Amateur radio activity has increased wonderfully in this section during the summer. While there has not been a great increase in operating, the increasing membership and attendance at the meetings of the Collegeville Radio Club show a decided increase in interest. Plans are being made for the coming relay season which promises to be the greatest ever. At the last meeting the regular election of officers was held. S. C. Baden was elected president and F. W. Mergenthaler Secretary-Treasurer. A committee was appointed to draw up a constitution for the club. The meetings are held every Tuesday evening at the station of G. G. Clamer, 3A1A, at which discussions are held. Correspondence with other clubs is invited.

#### TOTEM RADIO CLUB

As a part of the publicity and membership drive of the Totem Radio Club, of Seattle, a novel method is in use. A complete regenerative set, three step amplifier, Magnavox and loop antenna was installed

in an automobile owned by one of the members. With a large club sign on either side, it was driven through the business section of the city and attracted quite a bit of attention as music was received from the various 'phone sets around town loud enough to be heard a block away. Incidentally, care was taken to stop in front of the local newspaper office.

Although the Totem Radio Club has been organized but a short time, it includes in its membership practically all of the licensed amateurs in Seattle. Excellent programs are given at its meetings, covering the practical and theoretical phases of radio work. The club's traffic committee is co-operating in fine shape with the other cities of the Northwest and has made order in a remarkably short time out of the fierce local QRM which existed heretofore. This progressive organization has also applied for affiliation with the American Radio Relay League.

Correspondence with other clubs is invited. Mr. G. E. Kinsey, 907 West 58th Street, Seattle, is the corresponding secretary.

#### IMPROVING THE C.W. GROUND SYSTEM

(Concluded from page 41)

quired to smooth out the 60-cycle hum completely. The maximum input in the antenna with a single tube varies from 250 to 450 watts without overheating the tube, and doubtless more energy could be put in by using a higher plate voltage.

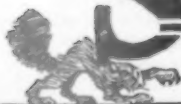
The helix consists of a power line lightning arrester choke coil made of 21 turns of  $\frac{3}{8}$ -inch aluminum rod wound in cylindrical form, 15 inches in diameter. Two old 2,000-volt transformers are used for supplying voltage to the Kenotron rectifiers. One is a five K.W. 133-cycle power transformer, while the other is a 250. watt potential transformer, both having a 20 to 1 ratio and both delivering the same watts to the rectifiers.

The antenna is also a make-shift affair consisting of a small horizontal cage of three No. 14 wires about forty feet high and eighty feet long.

2BML has been in operation for a number of months, and like many other C.W. stations, the radiation was about one-half ampere at first, but was gradually increased by experimentation until eight amperes was finally reached. Half-wave self-rectification was also tried with both 60 and 300 cycles. The 300-cycle source gave an exceedingly pure, musical note and was very successful, but the available generator was small and the antenna current was only about three amperes with full load on the 300-cycle generator. The C.W. signals from 2BML have been reported QSA on many occasions from stations within a 1,000 mile radius.

\*Reprinted by courtesy of Radio Corporation of America.

# Strays



M. S. Andelin, 6JT, Manager of our Rocky Mountain Division, stepped off this past June too. He says it does not mean that he is dropping out of the game, however, as he married the sister of a well-known DX amateur (QRA?) so there will be two operators at 6JT instead of one. Congratulations, OM!

9YY, the University of Nebraska, at Lincoln, Neb., now has a good 200 watt phone and C.W. set on which phonographic concerts are broadcasted twice daily at noon and 7:30 p.m. The set was designed by Mr. H. O. Peterson, E.E., who is the operator. The set has a range of several hundred miles phone, and as it is about the only high-power phone in that part of the country its concerts are being thoroly appreciated.

Wm. J. Murdock Co., of Chelsea, Mass., announce the opening of a New York sales office at 1270 Broadway, near 33d St., in charge of Mr. Percy W. Mack.

W. H. Kirwan, 9XE, manager of the 1921 Washington's Birthday Relay, advises us that several dealers and numerous amateurs are asking for another W. B. relay, using C.W. only. Mr. Kirwan wants to hear more opinions on the subject and requests that those interested let him know their views by addressing him at Box 148, Davenport, Iowa.

## "QTC West"

8XU! Oh 8XU!

How long must I yell that cue!

When you come back

(If you do come back)

Please don't sign "O U U U"!

—"Heterodyne".

Wouldn't it be wonderful if some fellows could raise something besides QRM?

Our old friend Kubiak, sometime 3VV, is now 3ZZ, and thereby hangs a tale, as the new call was tailor-made to fit his fist. It seems that when his call was 3VV he couldn't succeed in signing much besides 3ZZ, so when he was granted a special they made it 3ZZ because that was what he signed anyway. Hi!

Station 2FP, Brooklyn, using the equipment formerly at old 2RK, was reported QSA five times on the night of October 7th by 6ALE, Lindsay, at Reedley, Cal. 2FP was getting five amps. of C.W. in the antenna at the time, using 60-cycle on the plate of one 250-watt tube, input 600 watts.

Lament from Schweitzer, 9AAW, on the occasion of the burning out of a 1 k.w. tube:

"Backward, C.W., turn back, in my plight,  
And give me my coffin again, just for tonight!"

The radio men around White Plains, N. Y., have a new idea as shown in this



photograph—radio plates to match the license markers on their cars in color and size.

Recalling the case of the dishonest C & S Radio-Electric Co. of Omaha, recently mentioned in QST, the Glenhurst outfit who also got by us were some more of the same crowd. It will be recalled that the proprietors of C & S were Wilbur Cramer and Fred Swain. When we became suspicious of Glenhurst we made an investigation. Their general manager, one Wilfred Cascomp, had never been heard of in Omaha. That was funny. But Wilbur and Fred make Wilfred, and a process of reduction takes one thru C & S company, C&Scomp, Cascomp. Simple, isn't it? Yes, it was our old friends, and all advertising from the Omaha region is now investigated carefully before it is accepted.

"We look forward to a busy season here



in Boston and hope to connect not only with England but with Worcester and Springfield besides".—Sumner B. Young, President, Boston Executive Radio Council.

The cover design of the Radio Corp.'s new catalog showing a picture of 2ZL station prompts us to ask if any of our fraternity know the brand of tonic or restorer which J. O. used to produce such a luxurious sward since the original photograph with which we are all familiar was taken?

Ad in "Denver Post": "For Sale: Wireless material, andiron bulks, loose couplers, cheap." Even Doc deForest wouldn't recognize an audion bulb in this disguise.

New York "Sun", apropos the radio-controlled auto: "It has no *serial* or antenna system visible". Hi! Must be a continuous wave affair.

If visitors at 1ZE will inspect the ground system they will understand why its signals are so "strong".

1ADC at York Harbor, Me., has been reported QSA at 9KL, Spring Valley, Ill., on one tube. 1ADC has but  $\frac{1}{4}$  k.w. FB, OM.

The Westinghouse Elec. & Mfg. Co. announce that they have sold the assets of The International Radio Telegraph Co. to the Radio Corporation, retaining certain patents, and rights in foreign fields. They have also obtained a substantial interest in the stock of the Radio Corporation and made commercial agreements with them regarding the sale of radio equipment manufactured by Westinghouse, and which they will continue to manufacture.

In some syndicated lexicographer's stuff recently appearing in many newspapers, J.N.B. inquires "What does 'om' mean?". Now we thought we knew but it seems it is a little older than we thought. This was a Sanskrit sacred syllable similar to our Amen and had to be uttered before and after every recitation from the Veda or else the sacred knowledge and its benefits would be lost.

That training persists to this day, as witnesseth the diligence with which most amateurs sprinkle their air-talk with OM's.

Russell H. Pray, former Dakota Manager, ex-9EE and 9ZX, is now operating on the S. S. "West Henshaw" between Frisco and Yokohama.

3VR suggests that when vacuum tubes are mounted horizontally from a panel, the ends may be dipped in lamp coloring, which may be obtained in any color, and if dipped for about three coats the glare from the

filaments is removed.

We anticipate beautiful Christmas-tree effects, and some patriotic detector-two-steps will soon be displaying the red, white and blue.

The original blackness of discolored hard rubber may largely be restored by rubbing the surface with carbon disulphide.

The Canadian Marconi Co. transmit a radiophone concert on 1200 meters every Tuesday evening at 8 o'clock from their works at Montreal. The station call is 9AM, and the power  $1\frac{1}{2}$  k.w. with a range of well over 300 miles.

Clarkson College of Technology, 8BKR, Potsdam, N. Y., and Mr. K. E. Davis, 8BLX, same city, have spark and C.W. sets with good antenna current but altho only about a hundred miles from Montreal, Kingston and Burlington, no reports of their signals have been received. They are desirous of connecting up for relay work in a territory where stations are needed, and invite correspondence from nearby amateurs who are interested.

Where does 4GL get all his traffic? The "Savannah Press" publishes a radio column once a week and advises that 4GL will be glad to accept free citizen messages for transmission, giving his phone number. The business comes rolling in. This is an idea that others might try—get your local newspaper to tell the story.

Geneva, a sweet young thing, was listening to the conversation of two hams who might as well have been talking Chinese so far as she was concerned, when she heard one of them mention a "Wouff-Hong". "Oh, yes", she cried; "Wolf-Hounds, I just love them!" And then she wondered what they were laughing at.

*From the literature of a Detroit radio school:*

"Our instructor is S. W. Edwards, Federal Radio Inspector of the 18th radio district." Live and learn, eh, 18JE?

"Medbury" in the "New York Evening Journal" pokes a little innocent fun at the Seamen's Church Institute whose service makes it possible to prescribe medical attention for folks at sea, and interprets their call letters, KDKF, as meaning "Kall Doctor Kum Fixit".

WOULDN'T IT BE WONDERFUL—

If we could figure out a 1st district call from the formula given in September QST?

If they would pass a law against side-swipers?

If we all could hear as much on one tube as 1TS?

# Calls Heard



## HEARD DURING SEPTEMBER Unless Otherwise Specified

Amateurs reporting lists are requested to see instructions appearing at the head of this department in previous issues, and to observe following additional instruction:

(4) In order to distinguish between spark and C.W. stations, list spark stations from 1 to 9 in the usual manner, and then make a second paragraph in identical form listing the C.W. stations.

### Canadian 3BP, Newmarket, Ont.

(1ADL), (1AKG), (1AMD), (1ARY), (1ASF), (1AW), (1AJ), (1BCF), (1BDC), (1BDT), (1BJN), (1CK), (1CM), (1CN), (1DAD), (1GM), (1IA), (1RZ), (1SN), (1TS), (1ZE), (2AEA), (2AHK), (2AID), (2AIM), (2AJE), (2AJW), (2AKO), (2AQL), (2ARB), (2AWF), (2AWL), (2BFZ), (2BG), (2BK), (2BR), (2DI), (2EL), (2FP), (2JU), (2NF), (2OM), (2RR), (2TS), (2UA), (2WB), (2ZM), (3AC), (3AHK), (3AQR), (3BZ), (3CC), (3FS), (2HJ), (2HX), (3IW), (3XF), (4BQ), (4EY), (4GL), (5DA), (5EK), (5FV), (8ACF), (8ACY), (8AFD), (8AFS), (8AHS), (8AIB), (8AJT), (8AKW), (8AL), (8ANW), (8AOT), (8APB), (8AQV), (8AQZ), (8ARD), (8AVT), (8AWP), (8AXC), (8AYN), (8AYR), (8AYS), (8BBU), (8BEN), (8BK), (8BMA), (8BY), (8CF), (8CH), (8DR), (8EA), (8FA), (8FE), (8FT), (8GO), (8HJ), (8HP), (8HU), (8IN), (8IQ), (8JL), (8KM), (8LA), (8LH), (8MM), (8NQ), (8OI), (8PO), (8RQ), (8RU), (8SP), (8VJ), (8TN), (8TT), (8TY), (8UC), (8UK), (8UV), (8VQ), (8WA), (8WY), (8XK), (8XS), (8YN), (8ZD), (8ZV), (8ZZ), (9AAP), (9AAW), (9ACL), (9ACY), (9AMT), (9AN), (9AOU), (9ASJ), (9ASN), (9AWZ), (9AZA), (9BRI), (9CF), (9DAP), (9DAX), (9DHG), (9DIL), (9DWP), (9FS), (9FW), (9GB), (9GG), (9GN), (9GP), (9GX), (9HM), (9HP), (9KO), (9LQ), (9MC), (9ME), (9NQ), (9UW), (9PC), (9QH), (9UH), (9UU), (9XI), (9XM), (9YAK), (9ZC), (9ZN).

### Can. 2BF, Montreal, Que.

C.W.—1AJZ, 1CAK, (1TS), 2AJF, 2AWL, 2BBN, 2BFY, 2DN, 2FP, 2AHK, 2AQR, 2HG, 2VV, 2ZZ, 2ACY, 2AID, 2BK, 2IV, 2JQ, 2LX, 2NQ, 2AWZ, 2FW, 2ZN.

Spk.—1OE, 1SN, 2AZL, 2EL, 2FP, 2OM, 2BP (Can.), 2HJ, 4EY, 2AIB, 2AFS, 2AWZ, 2AWP, 2AYH, 2AYN, 2MM, 2MS, 2PM, 2SP, 2TT, 2RQ, 2WY, 2ZB, 2AAW, 2AIG, 2AWZ, 2BP, 2VQ, 2ZN.

### Can. 2AN, Montreal, Que.

1BY, 1CM, 1GM, 1GY, 1ITJ, 1TS, 1XE, 1XAD (fone), 1ZE, 1OT, 1BOK, 1HD, 1ACO, 1ADL, 1DEX, 1SN, 1BDC, 2AWL, 2AJW, 2OM, 2EL, 2DE, 2AKO, 2KL, 2TA, 2BGM, 2CC, 2AFD, 2VY, 2BK, 2BO, 2HU, 2AYN, 2AG, 2ZU, 2AY, 2ZQ, 2XB, 2ANY, 2HM, 2AF, 2ZJ, 2AN, 2AAW, 2ZN, Can. 2CI, Can. 3BP.

C. A. Service, 7 A.M. Sept. 27, at So. Milford, Nova Scotia  
1HK, 1IA, 1RV, 1ZE, 1ADL, 1AEV, 1AJR, 1ASF, 1BKP, 2OM, 2BP, 2VJ, 2AQR, 2ZO.

### IES, Brookline, Mass.

Spark—1OT, 2AMZ, 2AWF, 2BCF, 2BK, 2FP, 2OA, 2OM, 2QR, 2SQ, 2TS, 2UA, 2AC, 2AQR, 2BCU, 2CC, 2HJ, 2HX, 2IW, 2VW, 2XM, 2ACF, 2AFA, 2AGK, 2AJT, 2ANW, 2ARD, 2AWP, 2AYN, 2AYS, 2BO, 2BU, 2RQ, 2RU, 2TK, 2TT, 2WY, 2ACY, 2AWZ, 2ZJ, 2ZN, Can. 3BP.

C.W.—1ABY, 1AJP, 1ANQ, 1AOL, 1AYK,

(1AZJ), (1AZX), 1BES, 1BKA, 1BWK, 1CAC, (1CAK), 1CCZ, 1DAD, (1RZ), (1TS), (1XX), (2AB), (2ACT), 2AFP, 2AGB, (2AJF), (2AJW), (2AKO), 2ANZ, 2AWK, 2AWL, 2AXB, 2BAK, 2BEA, 2BFZ, 2BG, 2BGM, 2BND, 2BRB, (2BYS), 2CT, (2DN), 2EL, 2FP, 2GR, 2IA, 2KP, 2KY, 2OE, 2PE, 2RR, (2RU), 2VC, (2WI), 2XA, 2XK, 2ZV, 2AAE, 2AHK, 2AJD, 2AQR, 2BG, 2BZ, (2FM), (2FS), 2GR, (2HG), (2HJ), (2HX), 2IH, 2IK, 2MO, 2ZZ, 4GL, 2AAZ, 2AC, 2ACF, 2ADG, 2ADY, 2AHZ, 2AIO, 2AWX, 2AYW, 2BCL, 2BDU, 2BEF, 2BK, 2BO, 2BPL, 2BRC, 2DE, 2DR, 2GO, 2HA, 2IL, 2IQ, 2IV, 2JQ, 2KM, 2LX, 2NQ, 2QY, 2RQ, 2UJ, 2UK, (2VY), 2WY, 2XH, 2XK, 2XM, 2XV, 2ZV, 2ZZ, 2AAV, 2AJA, 2AWZ, 2FW, Can. 2BF, 2AW.

### 1CEB, Bridgeport, Conn.

1AGL, 1ANQ, 1AWB, 1AYK, 1AZJ, 1AZX, 1BKA, 1CAK, 1DH, 1ES, 1QN, 1RZ, 1TS, 1UN, 1XX, 2AB, 2ACT, 2AGB, 2AJF, 2AJW, 2AWK, 2AWL, 2AXB, 2AYZ, 2BFZ, 2BGM, 2BRC, 2CT, 2DN, 2EL, 2FP, 2GR, 2IA, 2KI, 2OE, 2QR, 2RA, 2RU, 2SB, 2XK, 2ZD, 2ZL, 2ZV, 2BZ, 2FS, 2HB, 2HG, 2IH, 2ZY, 2ZZ, 4GL, 2AIX, 2AIO, 2BCL, 2DE, 2DR, 2LX, 2IQ, 2NQ, 2VS, 2WR, 2XK, 2XH, 2XM.

Spark—1ADL, 1AFZ, 1AMD, 1ANZ, 1ARY, 1ASF, 1BDC, 1EDI, 1BDT, 1BJN, 1BPZ, 1CEC, 1CK, 1CP, 1CY, 1FB, 1GM, 1HK, 1OE, 1RX, 1SN, 1UL, 1WR, 1ZE, 2ACY, 2AID, 2AMZ, 2ARY, 2AZD, 2BCF, 2BFF, 2BK, 2CT, 2CY, 2DI, 2EL, 2FP, 2JU, 2OM, 2OX, 2NF, 2RM, 2TS, 2UK, 2ZC, 2AC, 2CC, 2DW, 2GX, 2HJ, 2HX, 2IW, 2OU, 2UC, 2EY, 2ACF, 2AGK, 2AJT, 2AOT, 2AWP, 2AYN, 2AYS, 2BO, 2HF, 2RP, 2RU, 2SP, 2ZR, 2ZZ, 2HR, 2ME, 2ZN, Can. 3BP.

### 1ASF, Medford, Mass.

1ACO, (1ADC), 1ADL, 1AEV, 1ANQ, C.W. 1AMD, 1AOK, (1ARY), 1AZD, C.W. 1AZJ, C.W. 1AZK, 1BDC, (1BPZ), (1BGF), 1BVB, 1BWY, 1CAK, (1CM), 1FB, 1GY, 1HK, 1HO, 1OE, (1OT), 1PY, 1RZ, (1TS), 1UL, 1XX, 1ZE, 2AAL, (2AJE), 2AJW, 2ACT, 2AWF, 2AWL, (2BK), 2BCF, 2BM, 2CT, (2CY), 2CX, (2DI), (2DO), 2DN, 2EL, (2FP), 2FS, (2JU), 2NF, (2OM), 2PV, 2QR, (2RM), 2SO, (2SQ), 2TJ, (2TS), (2UA), 2UC, (2UK), 2WB, 2AAM, 2AC, 2AL, 2ARN, 2BZ, 2CC, 2CNJ, 2DW, 2EM, 2FM, 2GM, 2GX, 2HG, (2HJ), 2HX, 2IW, 2MX, (2OU), 2PB, 2UQ, 2US, 2VV, (2VW), 2ZO, 2EY, 4GL, 5ZL, 2AAH, 2ACF, 2ADQ, 2AFD, 2AGK, 2AHU, 2AHV, 2AIO, 2AJP, 2AJT, 2AL, 2AOT, 2AQR, (2AQV), (2AWP), 2AYN, 2AYS, 2BBU, 2BCO, 2CF, 2CV, 2EZ, 2HU, 2HM, 2LX, 2IV, 2RU, 2SP, 2TT, 2VQ, 2XM, 2ZD, 2ZN, 2ZR, 2AAW, 2AWZ, 2BP, 2ME, 2QH, (2UH), 2ZJ, 2ZN, Canadian (3BP).

### 1MD, Dorchester, Mass.

1ADC, 1ADL, 1AGL, 1AMD, 1ARY, 1AZD, 1AZT, 1BDC, 1BGF, 1BPZ, 1BWJ, 1BWK, 1CCZ, 1CM, 1OE, 1OT, 1TS, 1ZE, 2AJW, 2AJA, 2AJE, 2AWF, 2AWK, 2BK, 2DA, 2DN, 2EL, 2FP, 2JU, 2OA, 2OM, 2RM, 2TS, 2UA, 2WB, 2AAE, 2AHK, 2AQR, 2BZ, 2CC, 2FS, 2GX, 2HJ, 2HX, 2IW, 2PB, 2TA, 2EA, 2EY, 4GL, 4CO, 5DA, 2AAZ, 2ACF, 2AFD, 2AGK, 2APB, 2AQV, 2AWP, 2AYN, 2BD, 2DY, 2EV, 2FW, 2HU, 2IZ, 2SP, 2TB, 2XR, 2ZD, 2AAW, 2HA, 2UU, 2ZU, Canadian (3BP).

### 1SN, Beverly, Mass.

(1ACO), (1ADL), (1ARY), 1AW, 1AZK, 1BWK, 1CM, 1HK, (1OE), (1OT), 1TS, (1ZE), 2AHU, (2AIM), (2AJE), 2AJF, 2AJW, 2AML, 2AMZ, (2ARY), 2AWE, (2AWL), (2BK), 2BM, (2CY), 2CT, 2DA, (2DI), (2DN), 2DO, 2EL, (2FP), 2GR, (2JU), (2OM), (2OX), (2RM), 2RU, (2SQ),

(2TS), (2UA), (2WM), 2XK, 3AAN, (3AC), 3AHK, 3AL, 3AQR, 3BCU, (3BG), 3BZ, 3CC, (3DW), 3GR, 3GX, 3HB, 3HG, (3HJ), 3HX, (3IW), 3LP, 3OU, 3PB, 3UC, (3UQ), 3YW, 3WB, (3XM), 3ZO, 3ZZ, 4EY, 4GL, 8ACF, 8ACY, 8AD, 8AFA, 8AFD, 8AFS, 8AGK, (8AHV), 8AIB, 8AIO, 8ANW, 8AQV, 8ARD, (8AWP), 8AYN, 8AYS, 8AXC, 8BBU, 8BO, 8BRL, 8DE, 8DY, 8EV, 8EZ, 8FE, 8IN, 8IV, 8FN, 8HJ, 8HP, 8HU, 8NQ, 8PW, (8RQ), 8RU, 8SP, 8TB, 8TK, 8TT, 8TY, 8UC, 8WY, 8ZD, 8ZN, 9AAW, 9ACY, 9AJA, 9AWZ, 9CP, 9DWP, 9FW, 9HM, 9HR, 9KO, 9ME, 9UU, 9XM, 9ZN, Canadian (2BF), (3BP).

#### 1BPR, Cambridge, Mass.

Spark—1CM, 1HO, 1OT, 1ZE, 1BGF, 1CHC, 2BG, 2BK, 2BM, 2CT, 2DI, 2DO, 2EL, 2FP, 2JU, 2OM, 2OX, 2RM, 2SQ, 2TS, 2UA, 2WB, 2WM, 2AHU, 2AJE, 2AID, 2AMZ, 2AQL, 2AWF, 3AC, 3BG, 3CC, 3GM, 3GX, 3HJ, 3HX, 3IW, 3IX, 3KM, 3LP, 3OU, 3PB, 3VW, 3XM, 3ZO, 3ZZ, 3AQR, 4EY, 8AL, 8BO, 8BQ, 8DY, 8EV, 8EZ, 8FT, 8HU, 8HT, 8MM, 8OI, 8PO, 8QM, 8RQ, 8RU, 8SP, 8TJ, 8TK, 8TT, 8TY, 8WY, 8ZD, 8ZZ, 8ACY, 8AFD, 8AGK, 8AIB, 8AJT, 8AMQ, 8ANW, 8AQV, 8ARD, 8AWP, 8AYS, 8BBU, 8BP, 8ME, 8UH, 8ZN, 9AAW, 9AMK, 9AWZ, 9DAX, Canadian 3BP.  
C.W.—1TS, 1XX, 1AGI, 1ANQ, 1AWB, 1AZJ, 1AZX, 1BES, 1BKA, 1BWK, 1CAK, 1DAD, 2AB, 2BG, 2CT, 2DN, 2EL, 2FP, 2GR, 2KP, 2OE, 2PE, 2RB, 2RU, 2WI, 2XA, 2ZL, 2ZV, 2ACR, 2ACT, 2ADL, 2AFP, 2AJF, 2AJW, 2AKO, 2AWK, 2AWL, 2AXB, 2BAK, 2BFZ, 2BND, 2BRB, 3BZ, 3CC, 3FM, 3FS, 3GR, 3HG, 3HJ, 3HX, 3MO, 3PB, 3QZ, 3ZO, 3ZZ, 3AAE, 3AHK, 3AQR, 4GL, 8AC, 8BK, 8BO, 8DE, 8DR, 8HA, 8HJ, 8IV, 8JQ, 8NQ, 8PN, 8PU, 8QY, 8SU, 8UK, 8VY, 8XK, 8XV, 8ZY, 8AAZ, 8ACF, 8ADG, 8ADY, 8AIO, 8AQZ, 8BCL, 8BDU, 8BEF, 8BLT, 8BRC, 8BO, 8EK, 8FW, 8IO, 8XI, 8ZN, 8ZY, 9AAV, 9AJA, 9ANE, 9AWZ, Canadian 9AW.

#### 1TS, Bristol, Conn.

Spark—1ACO, 1AD, (1ADL), 1ALK, (1ALP), 1AMD, (1ANT), 1APR, (1ARY), (1ASF), 1AU, 1AW, (1AXW), 1AYQ, 1AZK, (1BDC), (1BFE), (1BGF), 1BIR, 1BUN, 1BLH, (1BMA), 1BQM, (1BRW), 1BVB, 1BWY, 1CEC, 1CK, 1CM, 1CVS, 1DY, (1DZ), 1FU, 1FV, 1GM, 1HK, 1HO, 1IA, 1OE, 1OT, 1PU, 1PY, 1QP, 1SN, 1UL, 1ZE, 2AHU, 2AID, 2AJE, 2ANK, 2AQL, 2ARB, 2ARY, 2AWF, 2BGM, 2BK, 2CT, 2DA, 2DB, 2DN, 2DO, 2EL, 2FP, 2JJ, 2JU, 2KM, 2NF, 2OA, 2OM, 2OX, 2RM, 2SQ, 2TC, 2TS, 2UA, 2WB, 2WM, 2ZM, 3AC, 3AQR, 3CC, 3CG, 3GX, 3HG, 3HJ, 3HX, 3IW, 3LP, 3OU, 3TH, 3UQ, 3US, 3VW, 3WT, 3XC, 3XM, 3ZO, 3ZZ, (4EY), 5FJ, 5FV, 8AAV, 8ACF, 8ADQ, 8AFD, 8AFS, 8AGK, 8AHU, 8AHV, 8AIB, 8AIO, 8AJT, 8AJW, 8AKA, 8AL, 8AMB, 8AML, 8ANO, (8ANW), (8AOT), 8APB, 8AQV, 8ASJ, 8ASZ, 8AVT, 8AWP, 8AXC, 8AYM, 8AYN, 8AYS, 8BBU, 8BBW, 8BCO, (8BDY), 8BFV, 8BO, 8BP, 8CV, 8DY, 8DZ, 8EV, 8EZ, 8FE, 8GO, 8HP, 8HU, 8IAM, 8ID, 8IN, 8JP, 8MM, 8MR, 8MZ, 8OI, 8OJ, 8PM, 8QH, 8QM, 8RQ, (8RU), 8SP, 8TJ, 8TT, 8TY, 8TZ, 8UJ, 8WA, 8XA, 8XE, 8XS, 8XU, 8YN, (8ZA), 8ZD, 8ZN, 8ZR, (9AAW), 9ACB, 9ACY, 9AEG, 9AJI, 9AWZ, 9BP, 9CP, 9DAX, 9DIL, 9DWM, 9EE, 9HM, (9HR), 9MC, 9ME, 9MH, 9OR, 9OX, 9PC, 9UH, 9UU, 9WU, 9XM, 9YAC, 9YB, 9YM, 9ZN, Canadian (3BP), 3EI, 3EP.  
C.W.—1AB, 1ABY, 1ADB, 1AFZ, 1AJP, (1AJU), (1AKB) fone, (1AKG), 1ALY, 1AM, (1ANQ), 1AR, 1AYK, (1AYL) fone, 1AYZ, 1AZD, 1AZJ, 1AZL, 1AZW, (1AZX), 1BCB, 1BEP, 1BES, 1BKA, (1BWJ), 1BYM, 1BYX, 1CAK, 1CDR, 1CF, (1CK), (1DH), (1ES), 1FF, 1MB, (1OE), 1PY, (1QN), (1RU), 1RZ, 1SQ, 1UD, (1UN), 1WP, 1XAE fone, 1XE fone, (1XX), 2AB, 2ABQ, 2ACT, 2ADL, 2AFP, 2AJF, (2AJW), 2AKO, 2AQJ, 2AWK, 2AWL, 2AXB, 2AYZ, 2BAK, 2BFZ, 2BG, 2BGH, 2BGM, 2BND, 2BRB, 2BRC, 2CT, 2DA, (2DN) fone, 2EL, (2FP), 2FZ, 2GR, 2KL, 2KP, 2KY, 2MW, 2OE, (2RU), 2SB, (2WI), (2XA), 2XK, 2ZL, 2ZV fone, 3AAE, 3ADT, (3AHK), (3ANU), (3AQR), (3HG), (3BZ), (3CC), 3DM, 3EM, (3FM), (3FS), (3HG), (3HJ), 3HX, 3IH, 3MO, 3PB, 3WT, 3ZO fone, 3ZY, (3ZZ), 4CO, 4GL, 8AAZ, 8ABO, 8ABZ fone, (8ACF), 8ADG, (8ADY), 8AGK, (8AIO), 8AIX,

8AMQ fone, 8AOF, 8AQZ, (8ARW) fone, 8AVH, 8AWF, 8AWP, 8AYW, (8BCI), 8BEF, 8BFX, 8BJW, (8BK), 8BLT, 8BMA, 8BO, 8BQ, 8BQL, 8BRC, 8BRL, (8DE), (8DR), 8FQ, 8GO, 8HJ, 8HY, 8IQ, 8IRU, (8IV), (8JL), (8JQ), (8KM), 8LF, 8LX, 8LV, (8NQ), 8OH, 8PU, 8QM, (8QY), 8RQ, 8TB, 8TG, 8UB, 8UJ, (8UK), 8VY, (8WR), 8WY, 8XH, (8XK) fone, (8XM), 8ZL, 8ZV, 8ZZ, (9AAV), (9AJA), 9ARK, (9AWZ), 9BP, 9EK, (9FW), (9XAC), 9XI, 9XM, 9ZY, Canadian, (2BF), (9AW) fone.

#### 2CT, New York City

Spark—1ABB, 1ADL, 1AMD, 1ASF, 1AZK, 1BCF, 1BDC, 1BGF, 1BQE, 1BWY, 1BYK, 1CM, 1DY, (1OM), 1HO, 1OJ, 1OT, 1PU, 1SN, 1ZE, 8AJB, 8AQR, 8BDP, 8BER, 8BF, 8CC, 8CN, 8EW, 8GM, 8GX, 8HJ, 3LP, 3OU, 3TH, 3TL, 3UQ, 3VW, 3XF, 4EW, 4EY, 4FD, 8ACF, 8AFD, 8APB, 8AQV, 8AWP, 8RQ, 8SP, 8XE, 8ZD, Can. 3BP.

C.W.—1AJP, 1AKB, 1ANQ, 1AOL, (1AZD), 1AZJ, 1AZX, 1BKA, (1CAK), 1ES, 1OE, (1TS), 1UN, (1XX), 3AAE, 3ANU, 3BZ, 8CC, 3FS, 3FW, 3HG, 3HJ, 3RF, 3ZO, 3ZY, 3ZZ, 4FF, 4GL, 8AIO, 8AWP, 8BQ, 8DE, 8RQ.

#### 2AWF, Albany, N. Y.

Spark—(1ADL), 1AMD, (1BCF), 1BDC, 1BDT, 1BGF, (1BPZ), 1CK, (1CY), (1DY), (1FV), 1GM, 1HK, 1HO, 1RX, (1SL), 1XF, (1ZE), (2ACW), (2AID), 2AIM, (2AJE), 2ARY, (2BK), (2BQD), 2DA, 2EL, (2FP), 2GR, 2JU, (2OA), 2OM, 2RM, 2TS, 2WB, 3AAN, 3AQR, 3CC, (3CN), 3DW, 3FJ, (3FQ), 3GX, 3HJ, (3IW), 3US, 3VW, 3XF, 3ZO, 4BQ, (4EY), 5FV, 8ACF, 8AFD, 8AGK, 8AHH, 8AHW, 8AIB, 8AJT, 8AKQ, 8AMB, 8AMC, 8ANW, (8AOT), 8APB, 8APV, (8AQV), 8ARD, (8AWP), 8AWX, 8AXC, 8AYN, 8AYS, 8AZI, 8BDO, 8BO, 8BRL, 8CD, 8CF, 8DY, 8EV, 8FE, 8FU, 8GO, 8HU, 8IN, 8LV, 8MZ, 8OI, 8QM, 8RQ, 8RU, 8SP, (8TB), (8TY), 8XS, 8YN, 8ZD, 8ZN, 8ZR, 8ZZ, (9AAW), 9AJW, 9ASJ, (9FS), 9LQ, 9MC, 9UU, 9ZJ, Can 3BP.

C.W.—1AYK, 1DWI, 1RZ, 1UN, 2AJW, (2AQM), 2AWL, 2AXB, 2AZP, 2BFZ, 2BGM, (2FP), 2HI, 2ZV, 3ZO, 8BMA, 8DE, 8XK.

#### 2AWS, Freeport, L. I.

Spark—1ACO, 1ADL, 1AJP, 1ANQ, 1AMD, 1ARY, 1AYQ, 1AZK, 1AZX, 1BCF, 1BDC, 1BGE, 1BJE, 1BJM, 1BPL, 1BPW, 1BY, 1CK, 1CM, 1DR, 1GM, 1HK, 1HO, 1RV, 1SY, 1UH, 1ZE, 3AH, 3AQB, (3AQR), 3BFU, 3CC, (3DT), 3FJ, 3GV, 3GX, 3HJ, 3HK, 3IW, 3KG, 3KM, 3NX, 3UV, 4EY, 4UH, 8AC, 8ACF, 8ACS, 8AFD, 8AGK, 8AHK, 2AHU, 8ALD, 8AN, 8AOT, 8APB, 8APK, 8ASW, 8AWP, 8BCF, 8BDP, 8BV, 8BRL, 8DN, 8DY, 8EF, 8EZ, 8FE, 8HA, 8GO, 8RU, 8RV, 8SJ, 8SP, 8SR, 8TS, 8UP, 8VF, 8XN, 8YN, 8ZD, 8ZG, 8ZN, 8ZR, 9AWY, 9FV, 9GN, 9OR, 9UH, 9ZN, Can. 3BP.

C.W.—1ACO, 1AKG, 1ANK, 1AOL, 1AYK, 1AZD, (1AZJ), 1CAK, 1ES, 1FW, 1RZ, 1TJ, 1TS, 1UN, 1XAD, 1XX, 3AHK, 3JX, 3ZY, 3ZZ, 4GL, 8AY, 8BCL, 8BDU, 8BH, 8BK, 8BKR, 8BPL, 8DE, 8IO, 8IQ, 8IV, 8JQ, 8NQ, 8RK, 8UK, 8VS, 8XM, 8XV.

#### 2OM, Ridgewood, N. J.

1ACO, 1ACZ, (1ADL), 1AFZ, 1AHR, (1AJP C.W.), (1AKG), (1AMD), (1ARY), (1ASF), (1AW), (1AZJ C.W.), (1AZK), (1AZX C.W.), (1BCF), (1BDC), 1BDT, (1BGF), (1BGN), 1BKP, 1BVB, (1BWK C.W.), 1BZF, (1CM), 1CY, 1DF, (1DY), (1DZ), 1FM, (1GM), (1HK), (1IA), (1OE), (1OT), (1RV), 1RX, (1SN), 1TS C.W., 1UL, 1XX, (1ZE), (3BP), (3EI), Canadian, 3AAN, (3AC), 3ACT, 3AIS, (3AL), 3AQR, 3ASJ, 3BC, 3BZ C.W., 3CC, 3DN, 3DR, 3DW, 3HG Spk. & C.W., (3HJ), 3HX, (3IW), 3KM, 3MY, 3NX, (3OU), 3TH, (3UC), (3UQ), 3US, 3VV, 3WT, 3XF, (3XM), (3ZZ), 4AA C.W., 4BQ, (4BX), 4CO C.W., 4DH, (4EA), (4EY), 4FD, 4GL C.W., 4GN, 4XC, 5DA, 5FV, 5ZA, 5ZK, 5ZL, 8ACD, (8ACF), 8ACY, (8ADO), (8ADR), 8AEV, 8AFA, (8AFD), (8AFS), 8AFU, (8AGK), 8AHH, 8AHU, (8AIB), 8AIM, 8AIO C.W., 8AJE, 8AJT, 8AL, (8ANO), 8ANP, 8ANV, (8ANW), (8AOT), 8APB, 8APP, (8AQV), (8ARD), (8AVT), (8AWP), 8AWX, (8AXC), 8AY, (8AYN), (8AYS), (8BBU), (8BCO), (8BDY), 8BFV, 8BJW, 8BK C.W. spk., (8BO), 8BOI, 8BPL C.W., (8BRL), (8CV), 8DE C.W., 8DK, 8DR, 8DY, (8DZ), 8EA,

(8EV), 8EZ, 8FD, 8FE, (8FT), 8FU, 8GO, (8HU), (8ID), (8IL), (8IN), 8JQ C.W., 8JU, 8LH, 8LN, (8MM), (8OA), 8OL, (8OJ), (8RQ), 8RT, (8RU), (8SF), 8TB, (8TJ), 8TT, 8TY, 8TZ, 8UC, 8UK, 8V, 8W, 8X, 8Y, 8Z, 8AA, 8AB, 8AC, 8AD, 8AE, 8AF, 8AG, 8AH, 8AI, 8AJ, 8AK, 8AL, 8AM, 8AN, 8AO, 8AP, 8AQ, 8AR, 8AS, 8AT, 8AU, 8AV, 8AW, 8AX, 8AY, 8AZ, 8BA, 8BB, 8BC, 8BD, 8BE, 8BF, 8BG, 8BH, 8BI, 8BJ, 8BK, 8BL, 8BM, 8BN, 8BO, 8BP, 8BQ, 8BR, 8BS, 8BT, 8BU, 8BV, 8BW, 8BX, 8BY, 8BZ, 8CA, 8CB, 8CC, 8CD, 8CE, 8CF, 8CG, 8CH, 8CI, 8CJ, 8CK, 8CL, 8CM, 8CN, 8CO, 8CP, 8CQ, 8CR, 8CS, 8CT, 8CU, 8CV, 8CW, 8CX, 8CY, 8CZ, 8DA, 8DB, 8DC, 8DD, 8DE, 8DF, 8DG, 8DH, 8DI, 8DJ, 8DK, 8DL, 8DM, 8DN, 8DO, 8DP, 8DQ, 8DR, 8DS, 8DT, 8DU, 8DV, 8DW, 8DX, 8DY, 8DZ, 8EA, 8EB, 8EC, 8ED, 8EE, 8EF, 8EG, 8EH, 8EI, 8EJ, 8EK, 8EL, 8EM, 8EN, 8EO, 8EP, 8EQ, 8ER, 8ES, 8ET, 8EU, 8EV, 8EZ, 8FA, 8FB, 8FC, 8FD, 8FE, 8FF, 8FG, 8FH, 8FI, 8FJ, 8FK, 8FL, 8FM, 8FN, 8FO, 8FP, 8FQ, 8FR, 8FS, 8FT, 8FU, 8FV, 8FW, 8FX, 8FY, 8FZ, 8GA, 8GB, 8GC, 8GD, 8GE, 8GF, 8GG, 8GH, 8GI, 8GJ, 8GK, 8GL, 8GM, 8GN, 8GO, 8GP, 8GQ, 8GR, 8GS, 8GT, 8GU, 8GV, 8GW, 8GX, 8GY, 8GZ, 8HA, 8HB, 8HC, 8HD, 8HE, 8HF, 8HG, 8HH, 8HI, 8HJ, 8HK, 8HL, 8HM, 8HN, 8HO, 8HP, 8HQ, 8HR, 8HS, 8HT, 8HU, 8HV, 8HW, 8HX, 8HY, 8HZ, 8IA, 8IB, 8IC, 8ID, 8IE, 8IF, 8IG, 8IH, 8II, 8IJ, 8IK, 8IL, 8IM, 8IN, 8IO, 8IP, 8IQ, 8IR, 8IS, 8IT, 8IU, 8IV, 8IW, 8IX, 8IY, 8IZ, 8JA, 8JB, 8JC, 8JD, 8JE, 8JF, 8JG, 8JH, 8JI, 8JJ, 8JK, 8JL, 8JM, 8JN, 8JO, 8JP, 8JQ, 8JR, 8JS, 8JT, 8JU, 8JV, 8JW, 8JX, 8JY, 8JZ, 8KA, 8KB, 8KC, 8KD, 8KE, 8KF, 8KG, 8KH, 8KI, 8KJ, 8KK, 8KL, 8KM, 8KN, 8KO, 8KP, 8KQ, 8KR, 8KS, 8KT, 8KU, 8KV, 8KW, 8KX, 8KY, 8KZ, 8LA, 8LB, 8LC, 8LD, 8LE, 8LF, 8LG, 8LH, 8LI, 8LJ, 8LK, 8LL, 8LM, 8LN, 8LO, 8LP, 8LQ, 8LR, 8LS, 8LT, 8LU, 8LV, 8LW, 8LX, 8LY, 8LZ, 8MA, 8MB, 8MC, 8MD, 8ME, 8MF, 8MG, 8MH, 8MI, 8MJ, 8MK, 8ML, 8MN, 8MO, 8MP, 8MQ, 8MR, 8MS, 8MT, 8MU, 8MV, 8MW, 8MX, 8MY, 8MZ, 8NA, 8NB, 8NC, 8ND, 8NE, 8NF, 8NG, 8NH, 8NI, 8NJ, 8NK, 8NL, 8NM, 8NO, 8NP, 8NQ, 8NR, 8NS, 8NT, 8NU, 8NV, 8NW, 8NX, 8NY, 8NZ, 8OA, 8OB, 8OC, 8OD, 8OE, 8OF, 8OG, 8OH, 8OI, 8OJ, 8OK, 8OL, 8OM, 8ON, 8OO, 8OP, 8OQ, 8OR, 8OS, 8OT, 8OU, 8OV, 8OW, 8OX, 8OY, 8OZ, 8PA, 8PB, 8PC, 8PD, 8PE, 8PF, 8PG, 8PH, 8PI, 8PJ, 8PK, 8PL, 8PM, 8PN, 8PO, 8PP, 8PQ, 8PR, 8PS, 8PT, 8PU, 8PV, 8PW, 8PX, 8PY, 8PZ, 8QA, 8QB, 8QC, 8QD, 8QE, 8QF, 8QG, 8QH, 8QI, 8QJ, 8QK, 8QL, 8QM, 8QN, 8QO, 8QP, 8QQ, 8QR, 8QS, 8QT, 8QU, 8QV, 8QW, 8QX, 8QY, 8QZ, 8RA, 8RB, 8RC, 8RD, 8RE, 8RF, 8RG, 8RH, 8RI, 8RJ, 8RK, 8RL, 8RM, 8RN, 8RO, 8RP, 8RQ, 8RS, 8RT, 8RU, 8RV, 8RW, 8RX, 8RY, 8RZ, 8SA, 8SB, 8SC, 8SD, 8SE, 8SF, 8SG, 8SH, 8SI, 8SJ, 8SK, 8SL, 8SM, 8SN, 8SO, 8SP, 8SQ, 8SR, 8SS, 8ST, 8SU, 8SV, 8SW, 8SX, 8SY, 8SZ, 8TA, 8TB, 8TC, 8TD, 8TE, 8TF, 8TG, 8TH, 8TI, 8TJ, 8TK, 8TL, 8TM, 8TN, 8TO, 8TP, 8TQ, 8TR, 8TS, 8TU, 8TV, 8TW, 8TX, 8TY, 8TZ, 8UA, 8UB, 8UC, 8UD, 8UE, 8UF, 8UG, 8UH, 8UI, 8UJ, 8UK, 8UL, 8UM, 8UN, 8UO, 8UP, 8UQ, 8UR, 8US, 8UT, 8UU, 8UV, 8UW, 8UX, 8UY, 8UZ, 8VA, 8VB, 8VC, 8VD, 8VE, 8VF, 8VG, 8VH, 8VI, 8VJ, 8VK, 8VL, 8VM, 8VN, 8VO, 8VP, 8VQ, 8VR, 8VS, 8VT, 8VU, 8VV, 8VW, 8VX, 8VY, 8VZ, 8WA, 8WB, 8WC, 8WD, 8WE, 8WF, 8WG, 8WH, 8WI, 8WJ, 8WK, 8WL, 8WM, 8WN, 8WO, 8WP, 8WQ, 8WR, 8WS, 8WT, 8WU, 8WV, 8WW, 8WX, 8WY, 8WZ, 8XA, 8XB, 8XC, 8XD, 8XE, 8XF, 8XG, 8XH, 8XI, 8XJ, 8XK, 8XL, 8XM, 8XN, 8XO, 8XP, 8XQ, 8XR, 8XS, 8XT, 8XU, 8XV, 8XW, 8XZ, 8YA, 8YB, 8YC, 8YD, 8YE, 8YF, 8YG, 8YH, 8YI, 8YJ, 8YK, 8YL, 8YM, 8YN, 8YO, 8YP, 8YQ, 8YR, 8YS, 8YT, 8YU, 8YV, 8YW, 8YZ, 8ZA, 8ZB, 8ZC, 8ZD, 8ZE, 8ZF, 8ZG, 8ZH, 8ZI, 8ZJ, 8ZK, 8ZL, 8ZM, 8ZN, 8ZO, 8ZP, 8ZQ, 8ZR, 8ZS, 8ZT, 8ZU, 8ZV, 8ZW, 8ZX, 8ZY, 8ZZ, 9AA, 9AB, 9AC, 9AD, 9AE, 9AF, 9AG, 9AH, 9AI, 9AJ, 9AK, 9AL, 9AM, 9AN, 9AO, 9AP, 9AQ, 9AR, 9AS, 9AT, 9AU, 9AV, 9AW, 9AX, 9AY, 9AZ, 9BA, 9BB, 9BC, 9BD, 9BE, 9BF, 9BG, 9BH, 9BI, 9BJ, 9BK, 9BL, 9BM, 9BN, 9BO, 9BP, 9BQ, 9BR, 9BS, 9BT, 9BU, 9BV, 9BW, 9BX, 9BY, 9BZ, 9CA, 9CB, 9CC, 9CD, 9CE, 9CF, 9CG, 9CH, 9CI, 9CJ, 9CK, 9CL, 9CM, 9CN, 9CO, 9CP, 9CQ, 9CR, 9CS, 9CT, 9CU, 9CV, 9CW, 9CX, 9CY, 9CZ, 9DA, 9DB, 9DC, 9DD, 9DE, 9DF, 9DG, 9DH, 9DI, 9DJ, 9DK, 9DL, 9DM, 9DN, 9DO, 9DP, 9DQ, 9DR, 9DS, 9DT, 9DU, 9DV, 9DW, 9DX, 9DY, 9DZ, 9EA, 9EB, 9EC, 9ED, 9EE, 9EF, 9EG, 9EH, 9EI, 9EJ, 9EK, 9EL, 9EM, 9EN, 9EO, 9EP, 9EQ, 9ER, 9ES, 9ET, 9EU, 9EV, 9EZ, 9FA, 9FB, 9FC, 9FD, 9FE, 9FF, 9FG, 9FH, 9FI, 9FJ, 9FK, 9FL, 9FM, 9FN, 9FO, 9FP, 9FQ, 9FR, 9FS, 9FT, 9FU, 9FV, 9FW, 9FX, 9FY, 9FZ, 9GA, 9GB, 9GC, 9GD, 9GE, 9GF, 9GG, 9GH, 9GI, 9GJ, 9GK, 9GL, 9GM, 9GN, 9GO, 9GP, 9GQ, 9GR, 9GS, 9GT, 9GU, 9GV, 9GW, 9GX, 9GY, 9GZ, 9HA, 9HB, 9HC, 9HD, 9HE, 9HF, 9HG, 9HH, 9HI, 9HJ, 9HK, 9HL, 9HM, 9HN, 9HO, 9HP, 9HQ, 9HR, 9HS, 9HT, 9HU, 9HV, 9HW, 9HX, 9HY, 9HZ, 9IA, 9IB, 9IC, 9ID, 9IE, 9IF, 9IG, 9IH, 9II, 9IJ, 9IK, 9IL, 9IM, 9IN, 9IO, 9IP, 9IQ, 9IR, 9IS, 9IT, 9IU, 9IV, 9IW, 9IX, 9IY, 9IZ, 9JA, 9JB, 9JC, 9JD, 9JE, 9JF, 9JG, 9JH, 9JI, 9JJ, 9JK, 9JL, 9JM, 9JN, 9JO, 9JP, 9JQ, 9JR, 9JS, 9JT, 9JU, 9JV, 9JW, 9JX, 9JY, 9JZ, 9KA, 9KB, 9KC, 9KD, 9KE, 9KF, 9KG, 9KH, 9KI, 9KJ, 9KK, 9KL, 9KM, 9KN, 9KO, 9KP, 9KQ, 9KR, 9KS, 9KT, 9KU, 9KV, 9KW, 9KX, 9KY, 9KZ, 9LA, 9LB, 9LC, 9LD, 9LE, 9LF, 9LG, 9LH, 9LI, 9LJ, 9LK, 9LL, 9LM, 9LN, 9LO, 9LP, 9LQ, 9LR, 9LS, 9LT, 9LU, 9LV, 9LW, 9LX, 9LY, 9LZ, 9MA, 9MB, 9MC, 9MD, 9ME, 9MF, 9MG, 9MH, 9MI, 9MJ, 9MK, 9ML, 9MN, 9MO, 9MP, 9MQ, 9MR, 9MS, 9MT, 9MU, 9MV, 9MW, 9MX, 9MY, 9MZ, 9NA, 9NB, 9NC, 9ND, 9NE, 9NF, 9NG, 9NH, 9NI, 9NJ, 9NK, 9NL, 9NM, 9NO, 9NP, 9NQ, 9NR, 9NS, 9NT, 9NU, 9NV, 9NW, 9NX, 9NY, 9NZ, 9OA, 9OB, 9OC, 9OD, 9OE, 9OF, 9OG, 9OH, 9OI, 9OJ, 9OK, 9OL, 9OM, 9ON, 9OO, 9OP, 9OQ, 9OR, 9OS, 9OT, 9OU, 9OV, 9OW, 9OX, 9OY, 9OZ, 9PA, 9PB, 9PC, 9PD, 9PE, 9PF, 9PG, 9PH, 9PI, 9PJ, 9PK, 9PL, 9PM, 9PN, 9PO, 9PP, 9PQ, 9PR, 9PS, 9PT, 9PU, 9PV, 9PW, 9PX, 9PY, 9PZ, 9QA, 9QB, 9QC, 9QD, 9QE, 9QF, 9QG, 9QH, 9QI, 9QJ, 9QK, 9QL, 9QM, 9QN, 9QO, 9QP, 9QQ, 9QR, 9QS, 9QT, 9QU, 9QV, 9QW, 9QX, 9QY, 9QZ, 9RA, 9RB, 9RC, 9RD, 9RE, 9RF, 9RG, 9RH, 9RI, 9RJ, 9RK, 9RL, 9RM, 9RN, 9RO, 9RP, 9RQ, 9RS, 9RT, 9RU, 9RV, 9RW, 9RX, 9RY, 9RZ, 9SA, 9SB, 9SC, 9SD, 9SE, 9SF, 9SG, 9SH, 9SI, 9SJ, 9SK, 9SL, 9SM, 9SN, 9SO, 9SP, 9SQ, 9SR, 9SS, 9ST, 9SU, 9SV, 9SW, 9SX, 9SY, 9SZ, 9TA, 9TB, 9TC, 9TD, 9TE, 9TF, 9TG, 9TH, 9TI, 9TJ, 9TK, 9TL, 9TM, 9TN, 9TO, 9TP, 9TQ, 9TR, 9TS, 9TU, 9TV, 9TW, 9TX, 9TY, 9TZ, 9UA, 9UB, 9UC, 9UD, 9UE, 9UF, 9UG, 9UH, 9UI, 9UJ, 9UK, 9UL, 9UM, 9UN, 9UO, 9UP, 9UQ, 9UR, 9US, 9UT, 9UU, 9UV, 9UW, 9UX, 9UY, 9UZ, 9VA, 9VB, 9VC, 9VD, 9VE, 9VF, 9VG, 9VH, 9VI, 9VJ, 9VK, 9VL, 9VM, 9VN, 9VO, 9VP, 9VQ, 9VR, 9VS, 9VT, 9VU, 9VV, 9VW, 9VX, 9VY, 9VZ, 9WA, 9WB, 9WC, 9WD, 9WE, 9WF, 9WG, 9WH, 9WI, 9WJ, 9WK, 9WL, 9WM, 9WN, 9WO, 9WP, 9WQ, 9WR, 9WS, 9WT, 9WU, 9WV, 9WW, 9WX, 9WY, 9WZ, 9XA, 9XB, 9XC, 9XD, 9XE, 9XF, 9XG, 9XH, 9XI, 9XJ, 9XK, 9XL, 9XM, 9XN, 9XO, 9XP, 9XQ, 9XR, 9XS, 9XT, 9XU, 9XV, 9XW, 9XZ, 9YA, 9YB, 9YC, 9YD, 9YE, 9YF, 9YG, 9YH, 9YI, 9YJ, 9YK, 9YL, 9YM, 9YN, 9YO, 9YP, 9YQ, 9YR, 9YS, 9YT, 9YU, 9YV, 9YW, 9YZ, 9ZA, 9ZB, 9ZC, 9ZD, 9ZE, 9ZF, 9ZG, 9ZH, 9ZI, 9ZJ, 9ZK, 9ZL, 9ZM, 9ZN, 9ZO, 9ZP, 9ZQ, 9ZR, 9ZS, 9ZT, 9ZU, 9ZV, 9ZW, 9ZX, 9ZY, 9ZZ, 0AA, 0AB, 0AC, 0AD, 0AE, 0AF, 0AG, 0AH, 0AI, 0AJ, 0AK, 0AL, 0AM, 0AN, 0AO, 0AP, 0AQ, 0AR, 0AS, 0AT, 0AU, 0AV, 0AW, 0AX, 0AY, 0AZ, 0BA, 0BB, 0BC, 0BD, 0BE, 0BF, 0BG, 0BH, 0BI, 0BJ, 0BK, 0BL, 0BM, 0BN, 0BO, 0BP, 0BQ, 0BR, 0BS, 0BT, 0BU, 0BV, 0BW, 0BX, 0BY, 0BZ, 0CA, 0CB, 0CC, 0CD, 0CE, 0CF, 0CG, 0CH, 0CI, 0CJ, 0CK, 0CL, 0CM, 0CN, 0CO, 0CP, 0CQ, 0CR, 0CS, 0CT, 0CU, 0CV, 0CW, 0CX, 0CY, 0CZ, 0DA, 0DB, 0DC, 0DD, 0DE, 0DF, 0DG, 0DH, 0DI, 0DJ, 0DK, 0DL, 0DM, 0DN, 0DO, 0DP, 0DQ, 0DR, 0DS, 0DT, 0DU, 0DV, 0DW, 0DX, 0DY, 0DZ, 0EA, 0EB, 0EC, 0ED, 0EE, 0EF, 0EG, 0EH, 0EI, 0EJ, 0EK, 0EL, 0EM, 0EN, 0EO, 0EP, 0EQ, 0ER, 0ES, 0ET, 0EU, 0EV, 0EZ, 0FA, 0FB, 0FC, 0FD, 0FE, 0FF, 0FG, 0FH, 0FI, 0FJ, 0FK, 0FL, 0FM, 0FN, 0FO, 0FP, 0FQ, 0FR, 0FS, 0FT, 0FU, 0FV, 0FW, 0FX, 0FY, 0FZ, 0GA, 0GB, 0GC, 0GD, 0GE, 0GF, 0GG, 0GH, 0GI, 0GJ, 0GK, 0GL, 0GM, 0GN, 0GO, 0GP, 0GQ, 0GR, 0GS, 0GT, 0GU, 0GV, 0GW, 0GX, 0GY, 0GZ, 0HA, 0HB, 0HC, 0HD, 0HE, 0HF, 0HG, 0HH, 0HI, 0HJ, 0HK, 0HL, 0HM, 0HN, 0HO, 0HP, 0HQ, 0HR, 0HS, 0HT, 0HU, 0HV, 0HW, 0HX, 0HY, 0HZ, 0IA, 0IB, 0IC, 0ID, 0IE, 0IF, 0IG, 0IH, 0II, 0IJ, 0IK, 0IL, 0IM, 0IN, 0IO, 0IP, 0IQ, 0IR, 0IS, 0IT, 0IU, 0IV, 0IW, 0IX, 0IY, 0IZ, 0JA, 0JB, 0JC, 0JD, 0JE, 0JF, 0JG, 0JH, 0JI, 0JJ, 0JK, 0JL, 0JM, 0JN, 0JO, 0JP, 0JQ, 0JR, 0JS, 0JT, 0JU, 0JV, 0JW, 0JX, 0JY, 0JZ, 0KA, 0KB, 0KC, 0KD, 0KE, 0KF, 0KG, 0KH, 0KI, 0KJ, 0KK, 0KL, 0KM, 0KN, 0KO, 0KP, 0KQ, 0KR, 0KS, 0KT, 0KU, 0KV, 0KW, 0KX, 0KY, 0KZ, 0LA, 0LB, 0LC, 0LD, 0LE, 0LF, 0LG, 0LH, 0LI, 0LJ, 0LK, 0LL, 0LM, 0LN, 0LO, 0LP, 0LQ, 0LR, 0LS, 0LT, 0LU, 0LV, 0LW, 0LX, 0LY, 0LZ, 0MA, 0MB, 0MC, 0MD, 0ME, 0MF, 0MG, 0MH, 0MI, 0MJ, 0MK, 0ML, 0MN, 0MO, 0MP, 0MQ, 0MR, 0MS, 0MT, 0MU, 0MV, 0MW, 0MX, 0MY, 0MZ, 0NA, 0NB, 0NC, 0ND, 0NE, 0NF, 0NG, 0NH, 0NI, 0NJ, 0NK, 0NL, 0NM, 0NO, 0NP, 0NQ, 0NR, 0NS, 0NT, 0NU, 0NV, 0NW, 0NX, 0NY, 0NZ, 0OA, 0OB, 0OC, 0OD, 0OE, 0OF, 0OG, 0OH, 0OI, 0OJ, 0OK, 0OL, 0OM, 0ON, 0OO, 0OP, 0OQ, 0OR, 0OS, 0OT, 0OU, 0OV, 0OW, 0OX, 0OY, 0OZ, 0PA, 0PB, 0PC, 0PD, 0PE, 0PF, 0PG, 0PH, 0PI, 0PJ, 0PK, 0PL, 0PM, 0PN, 0PO, 0PP, 0PQ, 0PR, 0PS, 0PT, 0PU, 0PV, 0PW, 0PX, 0PY, 0PZ, 0QA, 0QB, 0QC, 0QD, 0QE, 0QF, 0QG, 0QH, 0QI, 0QJ, 0QK, 0QL, 0QM, 0QN, 0QO, 0QP, 0QQ, 0QR, 0QS, 0QT, 0QU, 0QV, 0QW, 0QX, 0QY, 0QZ, 0RA, 0RB, 0RC, 0RD, 0RE, 0RF, 0RG, 0RH, 0RI, 0RJ, 0RK, 0RL, 0RM, 0RN, 0RO, 0RP, 0RQ, 0RS, 0RT, 0RU, 0RV, 0RW, 0RX, 0RY, 0RZ, 0SA, 0SB, 0SC, 0SD, 0SE, 0SF, 0SG, 0SH, 0SI, 0SJ, 0SK, 0SL, 0SM, 0SN, 0SO, 0SP, 0SQ, 0SR, 0SS, 0ST, 0SU, 0SV, 0SW, 0SX, 0SY, 0SZ, 0TA, 0TB, 0TC, 0TD, 0TE, 0TF, 0TG, 0TH, 0TI, 0TJ, 0TK, 0TL, 0TM, 0TN, 0TO, 0TP, 0TQ, 0TR, 0TS, 0TU, 0TV, 0TW, 0TX, 0TY, 0TZ, 0UA, 0UB, 0UC, 0UD, 0UE, 0UF, 0UG, 0UH, 0UI, 0UJ, 0UK, 0UL, 0UM, 0UN, 0UO, 0UP, 0UQ, 0UR, 0US, 0UT, 0UU, 0UV, 0UW, 0UX, 0UY, 0UZ, 0VA, 0VB, 0VC, 0VD, 0VE, 0VF, 0VG, 0VH, 0VI, 0VJ, 0VK, 0VL, 0VM, 0VN, 0VO, 0VP, 0VQ, 0VR, 0VS, 0VT, 0VU, 0VV, 0VW, 0VX, 0VY, 0VZ, 0WA, 0WB, 0WC, 0WD, 0WE, 0WF, 0WG, 0WH, 0WI, 0WJ, 0WK, 0WL, 0WM, 0WN, 0WO, 0WP, 0WQ, 0WR, 0WS, 0WT, 0WU, 0WV, 0WW, 0WX, 0WY, 0WZ, 0XA, 0XB, 0XC, 0XD, 0XE, 0XF, 0XG, 0XH, 0XI, 0XJ, 0XK, 0XL, 0XM, 0XN, 0XO, 0XP, 0XQ, 0XR, 0XS, 0XT, 0XU, 0XV, 0XW, 0XZ, 0YA, 0YB, 0YC, 0YD, 0YE, 0YF, 0YG, 0YH, 0YI, 0YJ, 0YK, 0YL, 0YM, 0YN, 0YO, 0YP, 0YQ, 0YR, 0YS, 0YT, 0YU, 0YV, 0YW, 0YZ, 0ZA, 0ZB, 0ZC, 0ZD, 0ZE, 0ZF, 0ZG, 0ZH, 0ZI, 0ZJ, 0ZK, 0ZL, 0ZM, 0ZN, 0ZO, 0ZP, 0ZQ, 0ZR, 0ZS, 0ZT, 0ZU, 0ZV, 0ZW, 0ZX, 0ZY, 0ZZ, 1AA, 1AB, 1AC, 1AD, 1AE, 1AF, 1AG, 1AH, 1AI, 1AJ, 1AK, 1AL, 1AM, 1AN, 1AO, 1AP, 1AQ, 1AR, 1AS, 1AT, 1AU, 1AV, 1AW, 1AX, 1AY, 1AZ, 1BA, 1BB, 1BC, 1BD, 1BE, 1BF, 1BG, 1BH, 1BI, 1BJ, 1BK, 1BL, 1BM, 1BN, 1BO, 1BP, 1BQ, 1BR, 1BS, 1BT, 1BU, 1BV, 1BW, 1BX, 1BY, 1BZ, 1CA, 1CB, 1CC, 1CD, 1CE, 1CF, 1CG, 1CH, 1CI, 1CJ, 1CK, 1CL, 1CM, 1CN, 1CO, 1CP, 1CQ, 1CR, 1CS, 1CT, 1CU, 1CV, 1CW, 1CX, 1CY, 1CZ, 1DA, 1DB, 1DC, 1DD, 1DE, 1DF, 1DG, 1DH, 1DI, 1DJ, 1DK, 1DL, 1DM, 1DN, 1DO, 1DP, 1DQ, 1DR, 1DS, 1DT, 1DU, 1DV, 1DW, 1DX, 1DY, 1DZ, 1EA, 1EB, 1EC, 1ED, 1EE, 1EF, 1EG, 1EH, 1EI, 1EJ, 1EK, 1EL, 1EM, 1EN, 1EO, 1EP, 1EQ, 1ER, 1ES, 1ET, 1EU, 1EV, 1EZ, 1FA, 1FB, 1FC, 1FD, 1FE, 1FF, 1FG, 1FH, 1FI, 1FJ, 1FK, 1FL, 1FM, 1FN, 1FO, 1FP, 1FQ, 1FR, 1FS, 1FT, 1FU, 1FV, 1FW, 1FX, 1FY, 1FZ, 1GA, 1GB, 1GC, 1GD, 1GE, 1GF, 1GG, 1GH, 1GI, 1GJ, 1GK, 1GL, 1GM, 1GN, 1GO, 1GP, 1GQ, 1GR, 1GS, 1GT, 1GU, 1GV, 1GW, 1GX, 1GY, 1GZ, 1HA, 1HB, 1HC, 1HD, 1HE, 1HF, 1HG, 1HH, 1HI, 1HJ, 1HK, 1HL, 1HM, 1HN, 1HO, 1HP, 1HQ, 1HR, 1HS, 1HT, 1HU, 1HV, 1HW, 1HX, 1HY, 1HZ, 1IA, 1IB, 1IC, 1ID, 1IE, 1IF, 1IG, 1IH, 1II, 1IJ, 1IK, 1IL, 1IM, 1IN, 1IO, 1IP, 1IQ, 1IR, 1IS, 1IT, 1IU, 1IV, 1IW, 1IX, 1IY, 1IZ, 1JA, 1JB, 1JC, 1JD, 1JE, 1JF, 1JG, 1JH, 1JI, 1JJ, 1JK, 1JL, 1JM, 1JN, 1JO, 1JP, 1JQ, 1JR, 1JS, 1JT, 1JU, 1JV, 1JW, 1JX, 1JY, 1JZ, 1KA, 1KB, 1KC, 1KD, 1KE, 1KF, 1KG, 1KH, 1KI, 1KJ, 1KK, 1KL, 1KM, 1KN, 1KO, 1KP, 1KQ, 1KR, 1KS, 1KT, 1KU, 1KV, 1KW, 1KX, 1KY, 1KZ, 1LA, 1LB, 1LC, 1LD, 1LE, 1LF, 1LG, 1LH, 1LI, 1LJ, 1LK, 1LL, 1LM, 1LN, 1LO, 1LP, 1LQ, 1LR, 1LS, 1LT, 1LU, 1LV, 1LW, 1LX, 1LY, 1LZ, 1MA, 1MB, 1MC, 1MD, 1ME, 1MF, 1MG, 1MH, 1MI, 1MJ, 1MK, 1ML, 1MN, 1MO, 1MP, 1MQ, 1MR, 1MS, 1MT, 1MU, 1MV, 1MW, 1MX, 1MY, 1MZ, 1NA, 1NB, 1NC, 1ND, 1NE, 1NF, 1NG, 1NH, 1NI, 1NJ, 1NK, 1NL, 1NM, 1NO, 1NP, 1NQ, 1NR, 1NS, 1NT, 1NU, 1NV, 1NW, 1NX, 1NY, 1NZ, 1OA, 1OB, 1OC, 1OD, 1OE, 1OF, 1OG, 1OH, 1OI, 1OJ, 1OK, 1OL, 1OM, 1ON, 1OO, 1OP, 1OQ, 1OR, 1OS, 1OT, 1OU, 1OV, 1OW, 1OX, 1OY, 1OZ, 1PA, 1PB, 1PC, 1PD, 1PE, 1PF, 1PG, 1PH, 1PI, 1PJ, 1PK, 1PL, 1PM, 1PN, 1PO, 1PP, 1PQ, 1PR, 1PS, 1PT, 1PU, 1PV, 1PW, 1PX, 1PY, 1PZ, 1QA, 1QB, 1QC, 1QD, 1QE, 1QF, 1QG, 1QH, 1QI, 1QJ, 1QK, 1QL, 1QM, 1QN, 1QO, 1QP, 1QQ, 1QR, 1QS, 1QT, 1QU, 1QV, 1QW, 1QX, 1QY, 1QZ, 1RA, 1RB, 1RC, 1RD, 1RE, 1RF, 1RG, 1RH, 1RI, 1RJ, 1RK, 1RL, 1RM, 1RN, 1RO, 1RP, 1RQ, 1RS, 1RT, 1RU, 1RV, 1RW, 1RX, 1RY, 1RZ, 1SA, 1SB, 1SC, 1SD, 1SE, 1SF, 1SG, 1SH, 1SI, 1SJ, 1SK, 1SL, 1SM, 1SN, 1SO, 1SP, 1SQ, 1SR, 1SS, 1ST, 1SU, 1SV, 1SW, 1SX, 1SY, 1SZ, 1TA, 1TB, 1TC, 1TD, 1TE, 1TF, 1TG, 1TH, 1TI, 1TJ, 1TK, 1TL, 1TM, 1TN, 1TO, 1TP, 1TQ, 1TR, 1TS, 1TU, 1TV, 1TW, 1TX, 1TY, 1TZ, 1UA, 1UB, 1UC, 1UD, 1UE, 1UF, 1UG, 1UH, 1UI, 1UJ, 1UK, 1UL, 1UM, 1UN, 1UO, 1UP, 1UQ, 1UR, 1US, 1UT, 1UU, 1UV, 1UW, 1UX, 1UY, 1UZ, 1VA, 1VB, 1VC, 1VD, 1VE, 1VF, 1VG, 1VH, 1VI, 1VJ, 1VK, 1VL, 1VM, 1VN, 1VO, 1VP, 1VQ, 1VR, 1VS, 1VT, 1VU, 1VV, 1VW, 1VX, 1VY, 1VZ, 1WA, 1WB, 1WC, 1WD, 1WE, 1WF, 1WG, 1WH, 1WI, 1WJ, 1WK, 1WL, 1WM, 1WN, 1WO, 1WP, 1WQ, 1WR, 1WS, 1WT, 1WU, 1WV, 1WW, 1WX, 1WY, 1WZ, 1XA, 1XB, 1XC, 1XD, 1XE, 1XF, 1XG, 1XH, 1XI, 1XJ, 1XK, 1XL, 1XM, 1XN, 1XO, 1XP, 1XQ, 1XR, 1XS, 1XT, 1XU, 1XV, 1XW, 1XZ, 1YA, 1YB, 1YC, 1YD, 1YE, 1YF, 1YG, 1YH, 1YI, 1YJ, 1YK, 1YL, 1YM, 1YN, 1YO, 1YP, 1YQ, 1YR, 1YS, 1YT, 1YU, 1YV, 1YW, 1YZ, 1ZA, 1ZB, 1ZC, 1ZD, 1ZE, 1ZF, 1ZG, 1ZH, 1ZI, 1ZJ, 1ZK, 1ZL, 1ZM, 1ZN, 1ZO, 1ZP, 1ZQ, 1ZR, 1ZS, 1ZT, 1ZU, 1ZV, 1ZW, 1ZX, 1ZY, 1ZZ, 2AA, 2AB, 2AC, 2AD, 2AE, 2AF, 2AG, 2AH, 2AI, 2AJ, 2AK, 2AL, 2AM, 2AN, 2AO, 2AP, 2AQ, 2AR, 2AS, 2AT, 2AU, 2AV, 2AW, 2AX, 2AY, 2AZ, 2BA, 2BB, 2BC, 2BD, 2BE, 2BF, 2BG, 2BH, 2BI, 2BJ, 2BK, 2BL, 2BM, 2BN, 2BO, 2BP, 2BQ, 2BR, 2BS, 2BT, 2BU, 2BV, 2BW, 2BX, 2BY, 2BZ, 2CA, 2CB, 2CC, 2CD, 2CE, 2CF, 2CG, 2CH, 2CI, 2CJ, 2CK, 2CL, 2CM, 2CN, 2CO, 2CP, 2CQ, 2CR, 2CS, 2CT, 2CU, 2CV, 2CW, 2CX, 2CY, 2CZ, 2DA, 2DB, 2DC, 2DD, 2DE, 2DF, 2DG, 2DH, 2DI, 2DJ, 2DK, 2DL, 2DM, 2DN, 2DO, 2DP, 2DQ, 2DR, 2DS, 2DT, 2DU, 2DV, 2DW, 2DX, 2DY, 2DZ, 2EA, 2EB, 2EC, 2ED, 2EE, 2EF, 2EG, 2EH, 2EI, 2EJ, 2EK, 2EL, 2EM, 2EN, 2EO, 2EP, 2EQ, 2ER, 2ES, 2ET, 2EU, 2EV, 2EZ, 2FA, 2FB, 2FC, 2FD, 2FE, 2FF, 2FG, 2FH, 2FI, 2FJ, 2FK, 2FL, 2FM, 2FN, 2FO, 2FP, 2FQ, 2FR, 2FS, 2FT, 2FU, 2FV, 2FW, 2FX, 2FY, 2FZ, 2GA, 2GB, 2GC, 2GD, 2GE, 2GF, 2GG, 2GH, 2GI, 2GJ, 2GK, 2GL, 2GM, 2GN, 2GO, 2GP, 2GQ, 2GR, 2GS, 2GT, 2GU, 2GV, 2GW, 2GX, 2GY, 2GZ, 2HA, 2HB, 2HC, 2HD, 2HE, 2HF, 2HG, 2HH, 2HI, 2HJ, 2HK, 2HL, 2HM, 2HN, 2HO, 2HP, 2HQ, 2HR, 2HS, 2HT, 2HU, 2HV, 2HW, 2HX, 2HY, 2HZ, 2IA, 2IB, 2IC, 2ID, 2IE, 2IF, 2IG, 2IH, 2II, 2IJ, 2IK, 2IL, 2IM, 2IN, 2IO, 2IP, 2IQ, 2IR, 2IS, 2IT, 2IU, 2IV, 2IW, 2IX, 2IY, 2IZ, 2JA, 2JB, 2JC, 2JD, 2JE, 2JF, 2JG, 2JH, 2JI, 2JJ, 2JK, 2JL, 2JM, 2JN, 2JO, 2JP, 2J



8BO, 8BOY, 8BRL, 8CI, 8DZ, 8EZ, 8FE, 8FT, 8HO, 8HP, 8HU, 8IN, 8OI, (8RQ), 8RU, 8SP, 8TT, 8TY, 8UC, 8VF, 8WA, 8ZAA, 8ZD, 8ZN, 8ZR, 9AAW, 9ACY, 9AGA, 9AIR, 9CP, 9FS, 9HM, 9HR, 9LQ, 9MC, 9ME, (9UH), 9UU, 9ZJ, 9ZN.

C.W.—1AKB 1ANQ, 1AZJ, 1AZX, 1CAK, 1DH, 1TS, 2AWL, 2FF, 2FP, 2RU, 3AHK, 3HJ, 4GL, 5AHZ, 8AIO, 8LX, 8BK, 8BRL, 8DE, 8NQ, 8QY.

### 3AC, Baltimore, Md.

1ADN, 1ADL, 1AE, 1AEV, 1AMD, 1ARY, 1AVT, 1AW, 1BAK, 1BDC, (1BDT), 1BGF, 1BKA, 1BPZ, 1BS, 1CAN, 1CM, 1DEP, 1DZ, 1FV, 1GM, 1MK, 1OE, (1SN), 1TS, 1UN, (1ZE), 2AL, 2AIM, 2AJE, 2ANB, 2APL, 2ARA, 2ARB, 2ARD, 2ARY, 2ASU, 2AWF, (2AWL), 2BG, (2BK), 2DH, 2DN, 2EL, (2FP), 2FR, 2JU, 2LL, 2MZ, (2OM), 2OY, 2PF, 2RR, 2TS, 2TT, 2UA, (2UK), 2VK, 2WB, 2WM, 2XA, 2XK, 2YK, 2ZL, 3AIA, (3AL), 3ANU, (3AOS), 3AQR, 3ARB, 3BG, (3BP-Can.), 3BZ, 3CC, (3FY), 3HJ, 3HS, 3HX, 3IG, (3IW), (3KM), 3TM, 3UQ, (3VW), 3XF, (3XM), 3ZJ, 3ZO, 4BQ, 4EY, 4GL, 5FV, 5HZ, 5XK, 8ACF, 8ACS, 8ADV, 8ADY, 8AE, 8AFA, 8AFD, 8AFS, (8AGK), 8AGO, 8AGS, 8AHO, (8AIB), (8AIM), 8AJT, 8AJV, 8AJW, 8AN, 8ANU, 8AOT, 8AOY, 8AQV, 8ARD, (8AWP), 8AWS, (8AXC), (8AYN), 8AYS, 8BAF, 8BCO, 8BDY, 8BK, 8BO, (8CP), 8CG, 8CH, 8CP, (8CV), 8DE, 8DY, (8EA), 8EJ, 8EO, 8ESV, 8EV, (8EZ), 8FE, 8FQ, 8FT, 8FZ, 8HO, 8HP, 8HR, 8HU, 8ID, (8IN), 8IQ, 8JQ, 8JU, 8MM, 8MK, 8NQ, 8OA, 8OL, 8OJ, 8PN, 8QY, (8RQ), 8RU, 8SP, (8TK), 8TT, 8TY, 8UC, 8VC, 8WA, 8WK, 8WR, 8WY, (8WZ), 8XK, 8XV, 8YN, 8ZA, 8ZD, 8ZR, 8ZW, 9AAW, 9AEG, 9AJA, 9APS, 9ASJ, 9AW, 9BG, 9BO, 9DIL, 9FE, 9FS, 9GN, 9GO, 9HM, 9HO, 9HS, 9LQ, 9MC, 9ME, 9NJ, (9OX), 9SM, 9TH, 9UM, 9UU, 9WV, 9XM, 9ZC, 9ZJ, 9ZT, 9ZN.

### 4GL, Savannah, Ga., Oct. 1-10.

1AW, (1CAK), 1UN, 1TS, (2AKO), (2AJE), (2AWL), (2ZV), (2FP), (2EL), (2AJF), (2ADL), (2ABD), (2RU), (2DN), (2GZ), 2MW, 3ZO, (3BZ), (3HX), (3AAE), 3MO, 3UQ, (3SQ), 3OU, (4CO), (4FD), 4BQ, (4EN), (5DA), 5FV, 5ZL, 8VY, 8ACF, 8RM, (8JM), 8VJ, 8FL, (8AWP), 8BCI, 8ZZ, 8AFB, (8AMQ), 8BCO, (8LX), (8LU), (8BK), (8JS), (8DEI), (8AQF), 8DZ, 8BOX, 8KM, (8NQ), (9FW), (9AW), 9ARK, 9ASJ, 9XI, 9CP, 9WV, 9ZB, (9ZN), 9AVN, (9OX), Canadians, 3BP, (9AL), (9AW).

### 4EW, Wilmington, N. C.

1ARY, 1AZJ, 1BDT, 1BGF, 1CAK, 1JW, 1UN, 1TS, 2AJW, 2AWL, 2AXO, 2BND, 2DN, 2FP, 2LE, 2OM, 2XA, 3AAE, 3AHK, 3BFU, 3ACI, 3AL, 3BP, (Canadian), 3BZ, 3IW, 3LP, 3XM, 3ZD, 3ZS, 4AS, 4BE, 4BX, 4BY, 4DH, 4EC, 4EY, 4FD, 4FS, 4GL, 4GN, 4IW, 5DA, 5FV, 5XK, 8AFD, 8AFS, 8APK, 8BBU, 8AQV, 8BCI, 8BC, 8BO, 8BV, 8DE, 8DR, 8DZ, 8FT, 8HU, 8LX, 8NQ, 8UK, 8SP, 8VY, 8XB, 8ZN, 8ZR, 9ASJ, 9ME, 9OX, 9GX, 9UH, 9UU, 9ZN.

### 4EY, Elizabeth City, N. C.

Sparks—1AEV, 1AMD, 1AMP, (1BDC), 1BDK, (1BDT), 1BFC, 1BPQ, 1DY, 1FM, (1GM), 1HK, 1JJ, 1OE, 1ZE, (2AID), 2AIM, 2AJE, 2AJN, 2ANL, 2AQI, 2AWK, 2BFC, 2BK, 2BCF, (2DA), 2EH, (2EL), (2FP), (2JU), 2NF, (2OA), (2OM), (2RM), 2RQ, (2SK), 2SQY, (2TS), 2XQ, (2XF), (2ZM), (3AAN), 3AC, 3ACM, 3AHK, 3AIS, 3AP, 3AQ, (3AQR), (3BG), 3BZ, (3CC), 3CG, (3DW), 3EC, 3FR, (3GX), 3HG, (3HJ), 3HX, 3IW, 3KM, 3PB, (3UC), (3UQ), 3UX, 3VV, (3XF), 3ZO, (3ZZ), (4BQ), 4BY, 4EQ, (4FD), 4IE, 4JB, 5DA, 5FV, 8AAH, (8ACF), 8ADQ, (8AFB), (8AFD), 8AGK, 8AJB, 8AJD, 8AJT, 8APB, 8ATU, 8AUC, 8AV, 8AVI, 8AWP, 8AXC, 8AYN, 8AYS, 8BEP, 8BK, 8BO, 8BQT, 8BZ, 8DY, 8EF, 8ER, 8FE, 8GG, 8GM, 8HP, 8HU, 8ID, (8IN), 8RQ, 8RU, (8ST), 8TT, 8VQ, 8ZD, 8ZR, 9ACY, 9FE, 9MC, (9LQ), 9ZJ, 9ZN.

C.W.—(1ADL), (1AZJ), (1BWK), 1CAK, 1CCZ, 1CF, 1TS, 1UN, 1XX, 2AJF, 2AWL, 2BGH, (2DN), 2EL, (2FP), 2GR, 2RP, 2RR, 2ZL, 2ZV, 3AA, 3AHK, (3AQR), 3BG, 3BZ, 3CC, 3DM, 3HG, 3HJ, (3XF), 3ZO, (3ZY), 8ACF, 8AHZ, 8ATR, 8BDU, 8BQ, 8BCI, 8BK, 8BMQ, 8DR, 8IQ, 8HJ, 8LX, 8NQ, 8QY, 8ZE.

### 4XC, Atlanta, Ga.

Spark—2EL, 2FB, 2BM, 3HS, 3IW, 4EY, 4FD, 4GN, 5EK, 5ER, 5FV, 5HK, 5XJ, 5ZAB, 5ZL, 5LO, 8ACF, 8AFD, 8AFS, 8AGK, 8AIB, 8AJV, 8AKV, 8ANK, 8ANO, 8ARS, 8AXC, 8AYN, 8BBU, 8BDY, 8BO, 8CF, 8DJ, 8EH, 8EZ, 8FT, 8HU, 8ID, 8IN, 8OI, 8NAE, 8RQ, 8SP, 8TD, 8UC, 8WY, 8WZ, 8XE, 8XM, 8YN, 8ZA, 8ZAA, 8ZD, 8ZR, 9AAW, 9ACY, 9AEG, 9AIR, 9ALK, 9AQM, 9ASZ, 9AWZ, 9AXU, 9DWM, 9FS, 9HM, 9JN, 9LQ, 9MC, 9ME, 9MK, 9OX, 9PC, 9UH, 9UU, 9YZ, 9ZJ, 9ZN, Canadian 3BP.

C.W.—2AFP, 2AJF, 2AWL, 2BAD, 2FP, 2RV, 2KL, 3BZ, 3MO, 3RF, 3ZY, 3ZZ, 4FF, 4GL, 4ZE, 8ACF, 8AIO, 8BK, 8BOX, 8BPL, 8BRC, 8DE, 8DZ, 8IIV, 8IQ, 8JM, 8LX, 8NQ, 8RQ, 8VY, 8XK, 8XM, 8ZF, 9AW, 9ARK, 9AVN, 9XI, 9IO, 9ZB.

### 4BX, Wilmington, N. C.

1AN, 1AW, 1ADL, 1AIN, 1AMD, 1ARY, 1AZJ, 1BP, 1BCF, 1BDC, 1BGF, 1CM, 1CAK, 1DY, 1FV, 1HO, 1RD, 1RM, 1TS, 1UN, 1WND, 2AJE, 2AJF, 2AJW, 2AWC, 2AWL, 2BK, 2CC, 2CY, 2DA, 2DN, 2EL, 2EY, 2FJ, 2FP, 2GR, 2HP, 2JU, 2LD, 2OE, (2OM), 2RM, 2TS, 2UA, 2UN, 2UN, 2WB, 2XF, 2ZV, 2ZL, 2ZZ, 3AC, 3AHK, 3AQR, 3AS, 3BZ, 3CC, 3EFV, 3HJ, 3HS, 3IW, 3JJ, 3US, 3UQ, 3VV, 3XF, 3ZO, 4BZ, 3ZZ, 4BQ, 4CX, 3EY, 4FP, 4FE, 4FD, 4GL, 4IL, 5DA, 5FV, 5XK, 5AL, 8ACF, 8ACW, 8ADO, 8AFS, 8AFD, 8AGK, 8AHY, 8AIO, 8AJT, 8AJV, 8AQV, 8AQZ, 8AWP, 8AXC, 8AYS, 8BO, 8BCN, 8BDU, 8DE, 8DP, 8DR, 8DY, 8EY, 8HU, 8IP, 8IQ, 8IZ, 8JM, 8LF, 8LJ, 8MQ, 8MFD, 8NK, 8RU, 8RFD, 8SP, 8SW, 8XM, 8XV, 8ZC, 8ZD, 8ZN, 8ZR, 9AF, 9AO, 9AAW, 9ARD, 9AWU, 9CP, 9DWN, 9FI, 9GW, 9GX, 9LQ, 9MC, 9ME, 9MEC, 9MEX, 9RO, 9TQ, 9UH, 9UU, 9WP, 9WV, 9ZJ, 9ZN, Can. 3BP.

### 5CI, Frost, Tex., October.

Spark—5AA, 5AI, 5AO, 5EK, 5FI, 5HM, 5IQ, 5IR, 5IX, 5KY, 5LB, 5LM, 5LO, 5NF, 5NS, 5PE, 5QI, 5QQ, 5RB, 5XB, 5XI, 5XJ, 5XU, 5YL, 5YZ, 5ZA, 5ZAC, 5ZC, 5ZJ, 5ZL, 5ZO, 5ZR, 5ZU, 5ZZ, 6ZZ, 9AEG, 9AEK, 9AUO, 9EL, 9FZ, 9MC, 9OR, 9PS, 9XM, 9YAK, 9YM, 9YMM, 9ZMC, 9ZU.

C.W.—4KO, 4LE, 5BB, 5FF, 5LA, 5ZA, 8ZL, 8UK, 8VJ, 8VY, 9AAO, 9AAV, 9ARK, 9AVN, 9KV, 9XAH, 9XH, 9XM, 9ZB.

### 5IX, Dallas, Tex.

5AF, (5AL), 5DA, 5DO, 5DP, (5DW), 5ED, 5EH, 5EK, (5EW), 5FA, 5FO, 5FR, 5AK, 5AZ, (5IC), (5LE), 5IQ, 5IR, 5UI, 5UU, (5UL), (5LC), 5LO, (5ME), 5MM, 5MN, (5NC), (5NF), (5NI), 5NK, (5NS), (5OI), (5PE), (5PT), (5QI), 5QQ, 5RM, 5RR, 5XB, 5XJ, 5YI, 5ZA, (5ZC), 5ZF, 5ZL, 5ZO, 5ZI, 5ZU, 5ZX, (5ZAF), 5ZAG, (5ZAM), 6AX, 6IG, 6RZ, 6WV, 7YL, 8DE, 8TY, 8AFZ, 9AC, 9BT, 9CT, 9EE, 9HG, 9HM, 9LG, 9MC, 9PM, 9PS, 9UU, 9WT, 9WU, 9WZ, 9XI, 9XM, 9YA, 9YI, 9YO, 9ZB, 9ZG, 9ZN, 9ZY, 9ABB, 9ACB, 9AEC, 9AED, 9AEG, 9AEQ, 9AEC, 9AFX, 9AHG, 9AMU, 9AOU, 9ARB, 9AWK, 9AYC, 9AYW, 9DUB, 9DUG, 9DZJ, 9YAK, 9ZAC, 9ZAM.

### 5LO, Miami, Okla.

Spark—4BY, 5EK, 5ES, 5FO, 5FV, 5HK, 5HL, 5HZ, 5IR, 5JD, 5JR, 5LA, 5LC, 5NF, (5NK), 5NR, 5NS, 5QI, 5QQ, 5QS, 5QU, 5RA, 5RB, 5RJ, 5RZ, 5UV, 5XB, 5XI, 5XJ, 5ZA, 5ZD, (5ZL), 5ZS, 5ZU, 5ZX, 5ZAB, 5ZAM, 6AY, 6WV, 8BF, 8DE, 8DR, 8EM, 8EZ, 8FT, 8SP, 8TJ, 8TK, 8TT, 8YN, 8ZR, 8AFB, 8ARS, 9AF, 9DM, 9EE, (9EL), (9FT), 9FL, 9FS, 9FW, 9GL, (9GN), (9GQ), 9GY, 9HM, 9HO, 9IY, 9JN, 9KA, 9KO, 9LW, 9MC, 9MQ, 9NQ, 9OA, 9OR, 9PN, (9PS), 9QM, 9RY, 9TL, 9TO, 9TV, 9UU, (9UW), 9XI, 9XM, 9YA, 9YM, 9YO, 9YT, 9ZB, 9ZC, 9ZJ, 9ZN, 9AAB, 9AAW, 9ABU, 9ABV, 9ACB, 9ACL, 9ACN, 9ACY, (9ADR), 9AEG, 9AEY, 9AFF, 9AFX, 9AIF, 9AJH, 9ALK, 9AMA, (9AMK), (9AMV), 9ANF, 9ANP, 9ANU, 9ANX, (9AOU), 9AOW, 9ARZ, 9ARK, 9ASJ, 9ASN, 9ATN, 9ATP, 9AUO, 9AWZ, 9AXU, 9AYW, 9AYZ, 9DEH, 9DFL, (9DHB), 9DH, 9DIL, 9DJX, 9DKX, 9DQ, 9DT, (9DUG), 9DUB, 9DWP, 9DWW, 9DYA, 9DZO, 9TEY, 9XAE, 9YAE, 9ZAG.

C.W.—1ANK, 1DWI, 3BL, 3AAE, 4BQ, 4BN.

4FD, 4FF, 4KD, 4TBZ, 5ZA, 5AI, 5BK, 5BO, 5DE, 5DR, 5DX, 5DZ, 5GL, 5HI, 5IQ, 5JQ, 5LF, 5LQ, 5NQ, 5NZ, 5RL, 5UK, 5VY, 5XC fone, 5XM, 5ZL, 5AAZ, 5ACF, 5AKW, 5AVH, 5BWX, 5AW, 5EK, 5LQ, 5VE, 5XI, 5XM, 5ZB, 5ZY, 5AAG, 5AAV, 5ABU, 5AGG, 5AJA, 5AMB, 5ASD, 5AVN, 5AWZ, (5DHB), 5DJB, 5DYG, 5XAE.

#### 5JR, Enid, Okla.

5DW, 5EK, 5EU, 5FO, 5GG, 5HI, (5HK), 5HV, 5HZ, 5IF, 5KW, 5LC, 5NC, (5NS), (5PG), (5PU), (5QH), (5QP), 5QS, 5QX, 5XJ, 5YH, 5YV, 5ZU, 5ZX, 5ABU, (5AEG), 5AFX, 5AJW, 5AKC, 5AMS, 5ANP, 5ANK, 5ANP, (5AUO), 5AXM, 5AYW, (5DFL), 5EL, 5HM, 5JF, 5KO, 5KS, 5LQ, 5MC, 5PS, 5XAE, (5ZAC).

#### 5ZL, Little Rock, Ark.

2FP, 3BP, 3FS, 4BQ, 4DH, 4FD, 4GL, 4IE, 5AF, 5DA, 5DW, 5EK, 5EW, 5FA, 5FV, 5HK, 5HL, 5HV, 5HZ, 5IC, 5IE, 5IR, 5IS, 5IT, 5IX, 5JI, 5JR, 5KP, 5LC, 5LO, 5NP, 5NI, 5NK, 5NS, 5NV, 5OX, 5QI, 5QQ, 5QS, 5XI, 5XJ, 5ZA, 5ZAF, 5ZAG, 5ZAM, 5ZC, 5ZS, 5ZT, 5ZU, 5ZX, 5AEZ, 5AFD, 5ANO, 5BO, 5BT, 5CF, 5DE, 5EZ, 5IST, 5IV, 5KH, 5LF, 5LK, 5TK, 5VY, 5XH, 5WY, 5AAW, 5ABU, 5ACB, 5ACL, 5ACN, 5AEG, 5AEQ, 5AFK, 5AGG, 5AJW, 5AKC, 5AMA, 5AMK, 5ANF, 5AOW, 5AP, 5APN, 5APW, 5AWM, 5AUO, 5AWX, 5AWZ, 5AZA, 5BP, 5CP, 5DEH, 5DFL, 5DHG, 5DUG, 5DWM, 5ED, 5EL, 5FS, 5FU, 5FW, 5GN, 5JN, 5KA, 5KO, 5LQ, 5MC, 5OX, 5PS, 5UW, 5WI, 5WO, 5WT, 5YA, 5YM, 5YO, 5ZAC, 5ZB, 5ZJ, 5ZN.

#### 6PH, White at Sonora, Cal.

5ZA, 6AAU, 6ABP, 6ABR, 6ABW, 6ABX, 6ACY, 6ADP, 6ADL, 6AFA, 6AFN, 6AGF, 6AGX, 6AHU, 6AIB, 6AID, 6JH, 6AKL, 6ALK, 6ALU, 6AMN, 6AMW, 6ANG, 6APE, 6APH, 6AQU, 6ARK, 6ATV, 6AWH, 6BAC, 6AF, 6AK, 6BW, 6CH, 6CP, 6CR, 6CV, 6DA, 6DP, 6DR, 6EA, 6EB, 6ER, 6EX, 6FK, 6GL, 6GF, 6GR, 6GT, 6HY, 6IC, 6IF, 6IM, 6IS, 6JE, 6KA, 6KL, 6KC, 6KM, 6KP, 6LC, 6LE, 6MH, 6MN, 6MX, 6MZ, 6OC, 6OD, 6OH, 6OM, 6OO, 6OT, 6PJ, 6PR, 6SK, 6TF, 6TU, 6TV, 6VK, 6VX, 6WG, 6WI, 6WR, 6XAC, 6XAK, 6XB, 6ZK, 6ZU, 6ZZ, 7BK, 7BP, 7CC, 7CY, 7CZ, 7ED, 7FL, 7GA, 7IW, 7KB, 7KJ, 7NI, 7OI, 7MP, 7YA, 7YS, 7ZJ, 7ZM, 7ZT, 7ZW, 7XD, 7XG.

#### 6ACI, San Jose, Cal.

6AR, 6DD, 6EA, 6EB, 6EN, 6ER, 6GF, 6GI, 6HY, 6IC, 6JY, 6KA, 6KC, 6KP, 6LC, 6MH, 6OD, 6SK, 6TF, 6XE, 6XAN, 6ZB, 6ZM, 6ZN, 6ZR, 6ZU, 6ZX, 6AAT, 6ABW, 6ACY, 6ADL, 6AFN, 6AGL, 6ASH, 6AJW, 6ALE, 6ALU, 6AWY, 6BAA, 7FI, 7GA, 7IU, 7IN, 7LL, 7NW, 7OZ, 7KB, 7ZJ, 7ZT, 7YT.

#### 6AOW, Riverside, Cal.

5ZA, 6AC, 6AK, 6BA, 6CP, 6DA, 6DU, 6EA, 6EF, 6EG, 6EN, 6EF, 6FT, 6GF, 6GI, 6GR, (6GT), 6HY, 6IC, 6IF, 6IK, 6IS (6IV), 6JE, 6IY, 6KA, 6KC, 6KH, 6KI, 6KP, 6KS, 6KY, 6MB, 6MC, 6MG, 6MK, 6NY, 6OB, 6OD, 6PI, 6PJ, 6PP, 6PR, 6PY, 6R, 6RZ, 6SK, 6TF, 6TU, 6TY, 6VK, 6VX, 6WG, 6WI, 6XN, 6XD, 6ZB, 6ZJ, 6ZN, 6ZR, 6ZU, 6AAT, 6AAU, 6ABG, 6ABO, 6ABQ, 6ABX, 6ACR, 6ACY, 6ADL, 6AEL, 6AEZ, 6AFN, 6AGF, 6AGH, 6AGP, 6AIB, 6AHD, 6AHO, 6AHP, 6AHQ, 6AHU, 6AIC, 6AID, 6AIO, 6AIW, 6AJS, 6ALE, 6ALP, 6ALU, 6AMN, 6AMQ, 6ANC, 6ANY, 6APH, 6APO, 6APZ, 6AQT, 6AQW, 6ANS, 6ATG, 6ATO, 6ATQ, 6AUL, 6AVA, 6AVD, 6AVK, 6AVO, 6AVR, 6AVS, 6AVY, 6AWH, 6AWI, 6AZE, 6XAD, 6XAC, 6ZAE, 7RM, 7XD, 7YA, 7ZM, 7ZT.

#### 6IV, Riverside, Cal., Aug. 2-Sept. 26.

5ZA, 5ZJ, 6AC, 6AE, 6AK, 6AR, 6BW, 6CH, 6CP, 6CR, 6CV, (6DA), 6DP, 6DT, 6EA, 6EB, 6EF, 6EN, 6ER, 6EX, 6FE, 6FH, 6FK, 6FT, 6GF, 6GM, 6GP, 6GR, (6GT), 6HC, 6HY, 6IC, 6IS, 6KA, 6KC, 6KM, 6KP, 6KX, 6LC, 6MH, 6ND, 6OC, 6OH, 6PJ, 6PR, 6SK, 6TF, 6TV, 6VM, 6VX, 6WZ, 6AAG, 6AAH, 6AAK, 6AAT, 6AAU, 6AAV, 6AAW, 6ABM, 6ABN, 6ABW, 6ABX, 6ACR, 6ACV, 6ADA, 6ADL, 6ADP, 6AEL, 6AEZ, 6ANF, 6AGF, 6AGP, 6AGN, 6ARE, 6AHP, 6AIB, 6AIC, 6AID, 6AIO, 6AIW, 6AIU, 6AII, 6AII, 6AKL, 6ALE, 6AMW, 6ANK,

6AOL, (6AOW), 6APE, 6APO, (6APZ), 6ATB, 6ATF, 6ATG, 6ATV, 6ATQ, 6AUL, 6AVB, 6AWH, 6AWY, 6XAC, 6XAD, 6ZB, 6ZN, 6ZU, 6ZX, 6ZAE, 7BP, 7ED, 7FI, 7GA, 7GS, 7OZ, 7YA, 7XD, 7XP, 7ZB, 7ZJ, 7ZM, 7ZT, 9AYS.

#### 7KP, Seattle, Wash.

Canadian: 5BR, XEQ, XEV: 6AE, 6AH, 6DP, 6FH, 6GF, 6GR, 6HC, 6IC, 6KC, 6LC, 6OH, 6OP, 6TU, 6VX, 6WL, 6ZB, 6AAR, 6AAT, 6AAW, 6ABM, 6ABX, 6ACR, 6AER, 6AEW, 6AEG, 6AGF, 6AHM, 6AHV, 6AID, 6APE, 6APH, 6AWH, 6AWY, 7AW, 7BA, 7BC, 7BG, 7BP, 7BQ, 7CB, 7CC, 7CE, 7ED, 7EN, 7FI, 7EO, 7GA, 7HF, 7HI, 7ID, 7IN, 7JF, 7JT, 7KB, 7KM, (7LS), 7LW, 7LY, 7MY, 7YS, 7ZB, 7ZJ, 7ZM, 7ZS, 7ZT.

#### 7LU, Greybull, Wyoming

5FO, 5HK, 5ZA, 6CV, 6AEZ, 6ALE, 6ZM, 7DH, 7FI, 7HW, 7JQ, 7MO, 7MP, 7XD, 7ZG, 7ZO, 8NQ, 9EE, 9HM, 9MC, 9WI, 9ABU, 9AEG, 9AEY, 9AFX, 9AGN, 9AJP, 9AMB, 9ANF, 9AOU, 9ARZ, 9AYW, 9AXU, 9DFL, 9DZJ, 9XI, 9YAK, 9ZC, 9ZY, 9ZAC.

#### 7XD, Billings, Mont.

5HK, 5LA, 5ZA, 6ABX, 6AEQ, (6AEZ), 6AFT, (6AIB), 6AIZ, 6ALE, 6APE, 6ATQ, (6AWH), 6AX, C.W., (6CV), 6FL, (6GR), 6IC, (6OT), 6WV, 6XG, (6ZU), 6ZM, 6ZS, (7HM), (7HW), (7IM), (7LY), (7OZ), 7UT, (7XQ), 7YA, 7ZE, (7ZG), (7ZJ), 7ZK, (7ZM), 7ZN, (7ZO), 7ZR, (7ZS), (7ZT), 8XAD, 9ABU, (9AEG), 9AEY, 9AFW, 9AGN, 9AM, 9AMB, 9ANF, 9ANK, 9AOU, 9ARZ, 9ASF, 9AYA, (9AYS), 9DLJ, 9DSG, 9DUD, (9EE), (9HM), 9HT, 9HW, 9JN, 9LC, 9LF, 9OE, 9OI, 9PN, 9PS, 9STK, 9XW, (9YAK), 9ZA, 9ZAC, 9ZC, 9ZN, 9ZUG, 9ZY, C.W.

#### 7OT, Boise, Idaho

5ZA, 6AE, 6AK, 6AW, 6AAM, 6AAU, 6ABJ, 6ABK, 6ABM, 6ABX, 6ACR, 6ABI, 6AEZ, 6AFN, 6AGF, 6AGG, 6AGH, 6AHT, 6AJH, 6ALE, 6ALV, 6ANP, 6APE, 6ATH, 6ATQ, 6ATV, 6AVB, 6AVV, 6AWH, 6AWY, 6CP, 6CV, 6DP, 6EB, 6EC, 6ER, 6EZ, 6FH, 6GC, 6GF, 6GI, 6GR, 6HW, 6HY, 6IC, 6IS, 6IZU, 6KA, 6KC, 6KP, 6KU, 6KX, 6LK, 6MK, 6OH, 6PJ, 6PR, 6QR, 6RQ, 6SK, 6TU, 6VM, 6VV, 6VX, 6VY, 6WZ, 6YU, 6ZB, 6ZC, 6ZR, 6ZU, 7BP, 7BQ, 7CI, 7CN, 7DH, 7ED, 7FI, (7FT), (7FY), 7GA, 7GK, (7HJ), 7IN, 7IU, 7IV, 7IW, 7KB, 7KM, 7KS, (7LK), (7LN), 7LR, 7LU, 7MO, 7MP, 7NL, 7NN, 7NW, (7OK), 7XD, 7XF, (7YA), 7ZB, 7ZG, 7ZM, 7ZT, 9AYU, 9EE.

#### H. H. Howell, Medford, Oregon

6AH, 6AK, 6CV, 6DG, 6DP, 6EX, 6GF, 6GO, 6GR, 6IM, 6IS, 6KM, 6LN, 6LU, 6OC, 6OT, 6PJ, 6RR, 6TU, 6VK, 6VX, 6WR, 6WV, C.W., 6WZ, 6XB, 6XD, 6XI, 6ZU, 6AAU, 6AAW, 6ABM, 6ABX, 6ACR, 6ADL, 6AFN, 6AGF, 6AID, 6ATH, 6ATQ, 6ATV, 6AUB, 6AWH, 6XAB fone, 7BP, 7CN, 7DH, 7ED, 7FI, 7IM, 7IN, 7IW, 7KJ, 7KM, 7LY, 7MA, 7NL, 7OM, 7OZ, 7XD, 7XF, 7YA, 7YG, 7ZJ, 7ZM, 7ZS, 7ZT.

#### 10th Field Artillery, Camp Lewis, Wash., July to September.

4CB, 5BG, 5BF, 5CI, 5ER, 5ID, 5ZA, 6AK, 6AM, 6BG, 6BW, 6CY, 6DW, 6ER, 6EZ, 6GO, 6GF, 6HC, 6HX, 6IC, 6ID, 6FH, 6KA, 6MK, 6OH, 6TF, 6VX, 6XG, 6XW, 6ZA, 6ZM, 6ZR, 6ZU, 6AAG, 6AAQ, 6ABW, 6ABX, 6ACE, 6ACR, 6AEZ, 6AFN, 6AFZ, 6AGF, 6AGX, 6AKM, 6AJE, 6AMV, 6APC, 6AWH, 6XAC, 7BL, 7BP, 7BS, 7CB, 7CC, 7CA, 7ED, 7EK, 7FI, 7FT, 7GA, 7IC, 7IN, 7IM, 7IY, 7KI, 7NI, 7MP, 7XD, 7ZB, 7ZJ, 7ZN, 7ZS, 7ZW, 9AX, 9EE, 9XI, 9ZC.

#### 8BTN, Lansing, Mich., Crystal.

1ACA, 1AW, 2FK, 2AL, 3BB, 5EK, 5LD, 5RL, 5FK, 5FV, 7ZZ, 8IN, 8AN, 8UC, 8NZ, 8SW, 8FT, 8VY, 8AGN, 8SB, 8BO, 8XE, 8HP, 8SM, 8SK, 8ANK, 8AFD, 8AAK, 8AVO, 8AL, 8ARS, 8AD, 8IV, 8BP, 8SY, 8YN, 8BPG, 8ALW, 8VR, 8GU, 9JQ, 9VO, 9FS, 9AC, 9QN, 9ADY, 9CN, 9EE, 9AIB, 9AIX, 9DIM, 9LAC, 9YA, 9AC, 9HM, 9SB, 9ND, 9FS, 9NQ, 9ACQ, 9OK, 9ME, 9UN, 9UM, 9XM, 9OZ, 9FT, 9AN, 9AYN, 9FC, 9ZN, 9OZ, 9AWA.

**SDE, Akron, O.**

Spark—(1ADL), 1ARY, 1BDC, 1HK, 1ZE, 2AC, (2AIM), 2ARB, 2BK, 2DA, (2EL), 2FP, 2JU, 2NF, 2OM, 2TS, 2UA, 2WB, 3ACM, 3AIM, 3AQR, 3CC, 3HJ, 3HX, 3IW, 3OU, 3UC, 3UQ, 3XF, 3ZO, 4BQ, (4EY), 4GN, 5DA, 5FJ, 5FV, 5ZL, (8AAV), 8ACF, 8AFD, 8AHH, 8AIM, 8AMB, 8APB, 8ASV, 8AWP, (8AWX), 8BEP, 8BOI, (8DY), 8EF, 8FT, (8GW), 8HU, (8JU), 8KK, (8MM), (8OI), 8QM, 8RQ, 8RU, 8SP, 8TK, (8TT), 8UC, 8UP, 8VH, 8WY, 8XI, 8YN, 8ZD, (8ZN), 8ZR, 9AAW, 9AMK, 9AWU, 9AWZ, 9AYY, 9DAX, (9DOI), 9DWM, (9FS), 9GN, 9HR, 9KO, 9LQ, 9MC, 9ME, 9OX, 9QH, 9UH, (9UU), (9ZJ), 9ZN, Canadian 3BP.

C.W.—1AJU, 1ANQ, 1AYL, 1AZD, (1AZJ), 1BES, 1BY, 1CAK, (1RZ), (1TS), (1UN), 2AFP, 2AJF, 2AJW, (2AWL), 2BAK, 2DN, 2EX, 2GR, (2FP), (2RR), (2RU), 2XA, 2ZL, (3AEV), (3AQR), 3BZ, (3GR), 3ZZ, (4GL), 4ZO, (5DA), 8AFO, 8AIO, 8AKJ, (8AZ), 8ARW, (8AWX), (8BEF), (8BGD), 8BK, 8BQ, 8CF, 8DR, 8FB, 8FD, 8GW, (8HJ), (8JU), (8LX), 8OW, 8VY, 8WR, 8WY, (8XY), 8ZB, 8ZG, 8ZN, (8ZV), (9AWZ), (9FW), 9ZY.

**SAOI, Columbus, Ohio.**

1AW, 1ADW, 1AJJ, 1ASP, 1BN, 1BDC, 1BGF, 1CM, 1CAK, 1DZ, 1DPT, 1FN, 1GM, 1HK, 1IE, 1TS, 1ZE, 2AO, 2AID, 2AWL, 2BK, 2DR, C.W., 2EL, 2FP, 2GR, 2HX, 2JU, 2KL, 2KP, 2OM, 2WB, 2XA, 2ZL, 3AQR, 3BZ, 3HJ, 3KM, 3WP, 3XF, 4AG, 4BQ, 4DA, 4DH, 4EY, 4FD, 3FF, 4GL, 4GN, 4JB, 4ZL, 5DA, 5ED, 5EK, (5FV), 5GN, 5HK, 5IL, 5RZ, 5XK, 5ZA, 5ZL, (8ADO), (8AER), 8AFB, 8AFD, (8AFS), 8AGK, 8AHV, 8AIB, 8AIM, 8AIO, 8AIU, 8AJB, (8AJE), (8AJK), 8AJV, (8AJX), (8ANO), 8ANY, 8AOT, 8AQZ, 8ARK, (8ARUT), 8ASA, 8AWP, 8AKW, 8BB, (8BBU), 8BCO, 8BDO, 8BDY, (8BEN), (8BGF), (8BHO), (8BIS), 8BK, (8BKJ), (8BMW), (8BNA), (8BO), 8BOG, 8BRI, 8CF, 8DE, 8DZ, 8EA, 8EB, 8EZ, 8FE, 8FI, 8ID, 8IQ, 8JL, 8JM, 8KK, 8ML, 8OI, 8RE, 8RQ, (8SP), 8TG, 8TK, 8TN, 8TT, 8TY, (8UC), 8WA, 8WY, (8WZ), 8XB, 8XV, 8YN, (8ZAA), 8ZB, 8ZE, 8ZN, (8ZR), 9AAV, (9AAW), 9AGG, 9AIR, 9AMT, 9AMV, 9ANS, 9ANC, 9AOU, 9ASJ, 9ASO, 9AWZ, 9AXU, 9AYK, 9AYY, 9AZA, 9BP, 9CP, 9CX, 9DBU, 9DIH, 9DII, 9DSB, (9DWM), 9DZL, 9DTA, 9FN, 9FS, 9GN, 9GX, 9HM, 9HT, 9IA, 9KO, 9KK, 9LQ, 9MC, 9ME, 9OX, 9QH, 9TV, (9UHN), 9UU, 9XJ, 9XK, 9XM, 9YB, 9ZB, 9ZJ, (9ZN).

**SAW, Niles, Ohio.**

Sparks: 1AM, 1AMD, 1AW, 1GM, 1ZE, 2ASL, 2AZL, 2FP, (2OM), 2WB, 3AAV, 3AQR, 3BL, 3IW, 3XF, 4HF, 5DA, 5FJ, 5FV, 5ZL, 6ZZ, (8AAV), (8AFD), (8AFG), 8AFS, 8AHU, 8AIB, 8AIM, (8AKJ), (8AKY), (8AMF), 8AMP, 8ANX, 8AOT, 8APB, 8APP, (8ATZ), 8AVT, (8AWP), (8AWX), 8AWZ, 8AXC, 8AYN, 8BBU, 8BDP, (8BOY), 8BPK, 8AL, 8BK, 8BO, 8CH, 8DE, (8DY), 8EB, (8EZ), 8FI, (8GW), 8HB, 8HC, 8DE, (8DY), 8JL, 8JP, (8JU), 8OI, (8QC), 8QB, 8SC, 8SP, 8TK, (8TT), 8UC, 8WA, (8WJ), 8XE, 8YN, 8ZR, 8ZZ, 9AAW, 9AEQ, 9AIR, 9ASP, 9AWZ, 9AXU, 9AZA, 9DCB, (9DWM), 9UMT, 9BM, 9EP, 9CF.

**SBRI, Rome, New York**

Spark—1AB, 1ASQ, 1AWK, 1BDC, 1BDW, 1BGF, 1BOK, 1BZ, 1HK, 1HO, 1KM, 1MK, 1TJ, 1ZE, 2AJF, 2BD, 2BDC, 2BK, 2BM, 2FP, 2GM, 2OM, 2PJ, 2RC, 2RM, 2SK, 2UA, 2UP, 2WB, 3AQR, 3BMU, 3HJ, 3IW, 3SK, 3ABB, 3AF, 3AGK, (3AFB), 3AQS, 3AXO, (3BAC), 3BDP, 3BMZ, 3BOK, 3BRA, 3DY, 3FD, 3HU, 3IZH, 3MA, 3SA, 3SN, 3SP, 3SU, 3TOD, 3UPB, 3BDF, 3BWM.

C.W.—1AJ, 1AW, 1GM, 1XB, 1XJ, 2AJ, 2AJF, 2AJW, 2AQR, 2AWL, 2KL, 2KM, 2KP, 2OE, 2RV, 3AC, 3AWI, 3EJ, 3ZL, 3AFD, 3AJ, 3BAA, 3BMA, 3DE, 3IQ, 3XM.

**SLJ, Washington, Penna.**

Spark: 1AW, 1AMD, 1BDC, 1CAY, 1OM, 2AJE, 2BK, 2DA, 2EL, 2FP, 2KM, 2NF, 2OM, 3AQR, 3BK, 3CC, 3HJ, 3HX, 3IW, 3XF, 4BQ, 4BY, 4EY, 4UV, 5XK, 5FV, 5AGK, 5AYN, 5EV, 5AWP, 5AFD, 5EZ, 5AOT, 5YN, 5EA, 5TY, 5TJ, 5KO, 5APD, 5DV, 9AAW, 9AIG, 9AWU, 9DLX, 9FS, 9GX, 9LQ, 9HM, 9ME, 9MC, 9MK, 9HR, 9QH, 9UH, 9UU, 9ZJ, 9ZN.

C.W.—1AZD, 1AZJ, 1CAK, 1MO, 1TS, 2AFP, 2AJW, 2AWL, 2BND, 2EL, 2RM, 2RR, 2ZL, 2ZV, 3AAE, 3AEV, 3AHK, 3CC, 3FP, 3MO, 3ZY, 4GL, 5DA, 8AFQ, 8AJP, 8AYW, 8AIO, 8AHZ, 8BAF, 8BPL, 8BDU, 8XK, 8CI, 8ZV, 8VX, 8XM, 8OW, 8FB, 8WR, 8DE, 8NQ, 8IQ, 8AC, 8CF, 8DR, 8PX, 8PN, 8IV, 8HA, 8XV, 8VY, 8BOY, 8XY, 8JQ, 9ANE, 9AJA, 9AWZ, 9RV, 9UD, 9ZB, 9ZY.

**8ANM, Pittsburgh.**

Spark—1AW, 1CK, 1CY, 1DY, 1GM, 1HK, 1HO, 1ZE, 1ADL, 1ARY, 1BDC, 1BDT, 1BGF, 2BK, 2DA, 2EL, 2FP, 2JU, 2NF, 2OM, 2TS, 2UA, 2WB, 2ZM, 2ADL, 2AID, 2AIM, 2AJE, 2ARB, 2ARY, 2BMF, 3BP, (3Can), 3AC, 3CC, 3CG, 3DM, 3DW, 3GX, 3HB, 3HJ, 3HX, 3OU, 3VW, 3XF, 3ZY, 3AHK, 3AQR, 4BQ, 4EY, 5DA, 5FV, 5HK, 5XK, 8AY, 8BO, 8CP, 8DV, 8DY, 8EA, 8EV, 8FE, 8FT, 8GO, (8dite), 8HG, 8KY, 8LW, 8OI, 8OJ, 8RG, 8SP, 8TT, 8UC, 8VQ, 8WY, 8YN, 8ZZ, 8AFD, 8AGB, 8AGK, 8AHO, 8AIB, 8AKW, 8AJV, 8AMQ, 8ANO, 8AOT, 8APB, 8AQP, 8AUU, 8AWP, 8AYN, 8AYS, 8BCO, 8BDO, 8BDU, 8BTG, 8BTU, 8BP, 8CP, 8DL, 8FS, 8HM, 8HS, 8ZL, 8MC, 8ME, 8NQ, 8PC, 8UH, 8UU, 8ZJ, 8ZN, 9AAW, 9AEG, 9AFD, 9AJH, 9AMK, 9AOU, 9AQM, 9ARK, 9AWZ, 9DAX, 9DWM.

C.W.—1QN, 1RZ, 1ANQ, 1AWP, 1AZJ, 1BWK, 1CBJ, 1CCZ, 2DN, 2EL, 2FP, 2ZZ, 2ACT, 2AJF, 2AJW, 2AWI, 2AXB, 2AZX, 2BFZ, 2BN, 2ZJ, 4GL, 5DA, 8BQ, 8DE, 8GW, 8IL, 8IQ, 8JQ, 8LJ, 8LV, 8NQ, 8QU, 8WR, 8AJP, 8AOC, 8ASB, 9AW, 9FW, 9ZY.

**8SP, Fairmont, W. Va.**

1AW, 1ALK, 1AMD, 1ARY, 1BUT, 1ZE, 1AZJ, 1BWK, 1CAK, 1QN, 1RZ, 1TS, 2AIE, (2BK), 2BR, 2CY, (2DA), 2EL, (2OM), (2WB), 2XF, 2AJM, (2AJW), 2ANT, (2AWL), (2AYZ), 2BND, 2FS, 2FP, 2RU, 2XK, 2ZL, (3Can, 3PB), and (3KG), 3AAE, (3AQR), 3BF, (3DW), 3HB, 3OU, (3XF), 4BQ, (4EY), (4FD), 4XK, (4GL), 5DA, (5FV), 5RZ, 5DA, (8ABP), (8AFS), (8AGK), (8AIB), (8AJT), 8AMJ, (8ANO), (8ANY), (8ARD), 8AS, (8AWP), (8AYN), (8AYS), (8AXC), (8BBU), 8BDY, 8BK, (8BO), 8CF, (8EZ), 8FI, 8FN, (8HP), (8JF), (8JV), (8OI), 8PM, 8RU, 8TK, (8TT), (8WY), 8WZ, 8XE, 8YN, (8ZAA), (8ZN), (8ZZ), 8ADY, (8AIO), 8BK, 8BQ, 8BDU, 8BMA, 8CF, (8DE), 8DR, 8DX, (8FQ), 8HJ, 8IL, (8IQ), 8JM, 8LJ, (8QY), 8UK, (8VY), 8WR, 8XS, 8XV, (9AAW), 9ACA, (9ACC), (9AHM), (9AIJ), (9AIR), (9AJS), (9AOI), 9ARM, (9CP), 9DZL, (9FS), 9GN, 9HR, 9MC, (9ME), 9MK, (9OX), (9UH), 9LQ, 9RS, (9UU), (9VQ), 9ZAL, 9ZJ, 9ZN.

**9DMA, Caledonia, Minn.**

2FP, 2HG, 2RP, 2XA, 2AWL, 2BRB, 3BP, 3BQ, 4BZ, 5AF, 5BQ, 5DA, 5ED, 5EK, 5FV, 5HK, 5HZ, 5IR, 5JD, 5QI, 5QS, 5XB, 5ZL, 5ZP, 5ZU, 5ZAD, 6WV, 7ME, 7ZO, 8BK, 8BO, 8BR, 8CF, 8DE, 8DR, 8EA, 8EB, 8FI, 8FZ, 8HH, 8IQ, 8IV, 8KK, 8KM, 8LU, 8LX, 8NQ, 8NZ, 8RU, 8TJ, 8TT, 8UC, 8UJ, 8UP, 8VY, 8WI, 8WR, 8WY, 8YN, 8ZD, 8ZN, 8ACV, 8AFS, 8AGK, 8AIC, 8AIO, 8ANO, 8AYA, 8AYN, 8DHT, 8INO, 8AC, 8BP, 8CM, 8CP, 8EE, 8ET, 8FS, 8FW, 8GN, 8HM, 8HR, 8KO, 8LQ, 8MC, 8MS, 8NQ, 8OX, 8PS, 8PN, 8QM, 8RY, 8TV, 8US, 8UU, 8UR, 8VK, 8WI, 8XI, 8XM, 8YA, 8YM, 8YO, 8ZB, 8ZC, 8ZH, 8ZJ, 8ZN, 8ZY, 9AAV, 9AAW, 9ABU, 9ACB, 9ACL, 9ACY, 9AEG, 9AEH, 9AEY, 9AFC, 9AFD, 9AFK, 9AFX, 9AGN, 9HZ, 9AJA, 9AKS, 9ALB, 9ALD, 9ALI, 9AMB, 9AMS, 9AMT, 9ANJ, 9ANO, 9ANU, 9AOU, 9AQM, 9ARZ, 9AWZ, 9AXA, 9AXU, 9AYW, 9AZA, 9AZF, 9AZN, 9BHL, 9DAX, 9DEK, 9DFL, 9HJ, 9DIL, 9DJX, 9DKR, 9DOW, 9DQ, 9DUG, 9DWZ, 9DXM, 9DXU, 9DZJ, 9GTG, 9MEN, 9QHE, 9TAO, 9XAC, 9YAC, 9YAK, 9ZAC, 9ZMC, 9ZNC.

**9AHC, Ellendale, N. Dak.**

C.W.—1TS, 1CAK, 2FP, 2AWL, 3HG, 3AAE, 5AF, 5DA, 5DW, 6WV, 6ALE, 7HW, 8BK, 8CF, 8DE, 8DX, 8FD, 8II, 8IQ, 8IV, 8JQ, 8LV, 8NQ, 8OH, 8VY, 8XB, 8XM, 8ADY, 8AIO, 8AIV, 9AAV, 9ABU, 9AG, 9AJA, 9AJP, 9AMB, 9AVM, 9AZX, 9DYG, 9EK, 9FW, 9JD, 9RL, 9VD, 9VE, 9XAC, 9ZY, 9ACF, 9AKX, 9AWZ, 9XI.

(Continued on page 61)

# Radio Communications by the Amateurs

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## Defending Simplified Receivers

731 Rock Creek Road,  
Washington, D. C.

Editor, QST:

The article entitled "Simplified vs. Three-Circuit Regenerative Receivers" by Mr. Godley in September QST is in my opinion an unjust criticism of the receivers employing only one wave-adjusting circuit, especially in view of the recent radical improvements that have been made on this type of receiver. This opinion is not the result of snap-judgment but is based on many months of professional research in this subject.

I would like to prove the following facts in behalf of the properly designed single circuit tuner used in conjunction with a tuned plate regenerative device, in contrast to the three-circuit receiver.

1. A much greater signal audibility is possible.
2. Proper design can prevent any sacrifice in selectivity.
3. It possesses, by far, the greater ease of operation and simplicity.

The first aim in receiver design is to provide for the greatest possible potential difference between grid and filament of the vacuum tube since it is a potential operated device. This naturally results in maximum audibility in the telephones. In a coupled receiver, this means that the turns-ratio in favor of the secondary over the primary must be great. This fact is easily proven in a coupled receiver employing a series antenna capacity and a shunt secondary capacity. Experience tells us that, in such a set, maximum signal strength is obtained by using the greatest possible amount of antenna capacity and a minimum of secondary capacity. With this adjustment fewer primary turns are necessary and the secondary has many turns. We now have a great turns-ratio and can expect loud telephone response.

A series primary condenser reduces the effective antenna capacity and should be dispensed with, to maintain the high turns-ratio. Some of the present short wave sets employ no secondary capacity other than the distributed capacity of the coils and the tube capacity. This is done to obtain the high turns-ratio. A very great disadvantage in this is the fact that the

distributed capacity of the coils exceeds the tube capacity and a great deal of energy is dissipated in these coils which never reaches the tube. A recent prominent short wave receiver has gone back to the old method of shunt secondary capacity to prevent this, but here again the turns-ratio is spoiled.

It is at this point that a properly designed single circuit receiver more nearly approaches the ideal than any known method. If, in Figure 2 of Mr. Godley's article, the effective antenna capacity is made very low by placing the antenna condenser at minimum, a large amount of inductance is required and a very great potential difference is developed across the coil. The available inductance should be entirely cut in before the antenna condenser is touched. This gives us excellent signal strength throughout. After the inserted inductance becomes considerable, it is then that it is desirable to increase the effective antenna capacity and this is done only to avoid excessive H. F. resistance. I have designed a device whereby the single tuning knob first turns in inductance and then capacity and the entire dial circumference is utilized. So much for claim number one.

One single circuit tuner on the market is placed at a great disadvantage, as the variable inductance and capacity is increased together. If Mr. Godley used this type of set as an example of the single circuit receiver, it is by no means representative.

Some experimenters, without mature thought on the subject, claim that a single circuit tuner throws the antenna resistance into the grid circuit and decreases the selectivity of tuning. This is true but it can be counteracted by design. The coupled receiver is by no means ideal in this respect for it is subject to dissipation of energy by the continual action and reaction between the antenna and grid circuits and its accompanying losses. Slight coupling is only partially beneficial and it greatly reduces the strength of signal. The reason for this is found in the fact that the ordinary antenna resistances are not anywhere near sufficient for rapid damping of this circuit.

Let us consider the basis of non-selective reception. A circuit tends to oscillate at a frequency which will result in unity power factor. However, if the H. F. resistance of the circuit is greater than twice the



square root of the inductance over the capacity, the energy is dissipated so rapidly that oscillation is entirely prevented. From this law, it is evident that selectivity is improved as we reduce either the H. F. resistance or capacity, within limits. If the resistance must be tolerated as in the case of the antenna resistance in single circuit tuners, it is only necessary to work at small capacities which we also found advisable in the previous discussion. In actual design, it is necessary to keep the distributed coil capacity well under that of the minimum effective antenna capacity. The coil power factor should be kept low by using accepted geometric values in the coils and avoiding dielectrics, especially adhesives.

It is entirely unnecessary for me to comment on the ease and pleasure in operating a uni-circuit tuner, with a provision for regeneration, especially when it has been pre-calibrated in wave lengths to its antenna.

Now to back up theory with actual practice. I have been able to find no other Washington station that successfully received the Jersey City radio-phone report of the Carpentier-Dempsey contest through the heavy strays which prevailed at that time, although many attempts were made. Using the set I am trying to champion, I entertained ten people including newspaper reporters with perfect success. The set produces the same results on short waves. The September QST shows that the strays did not put me entirely out of commission during the Static Puncturing Contest as they did so many other Washington receivers. Also this reception was accomplished through the interference of two local radio-phone concerts.

Please do not be too hasty in passing judgment on the single circuit receivers. It certainly has won one friend and I believe the future will show an army of its admirers.

Yours very sincerely,  
Edmond Bruce.

### A Good Simplified Circuit

Kountze, Texas.

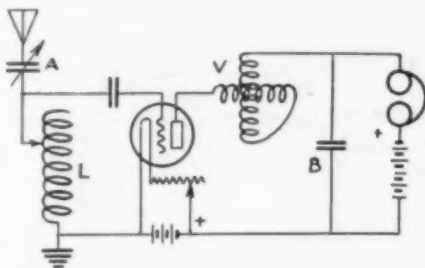
Editor, QST:

I notice recent articles and discussions on simple receivers to make for easier C.W. and phone reception. O.M., here's the thing, and if you will try it I think you will find it to be about as near as can be got.

Tuning condenser "A" is .0005 maximum, or less. Best results are had when using low values, say about .00025 mfd. "B" is the usual by-pass condenser. The coil should be tapped fairly frequently so that signals can be tuned using any desired combination of inductance and capacity. (Why not use a variometer instead of a tapped coil? Ed.) Variometer "V" con-

trols regeneration by tuning the plate circuit as usual.

By comparison with coupled variometer regenerator using plate variometer and secondary tuning condenser, weak signals are practically as loud and as sharp on this



circuit when the proper value of "A" is used. By controlling tuning with one hand and regeneration with the other the ideal CW-Phone set is very nearly realized.

73.

Arden Hooks, 5BB.

### Re 6EJ's Reception

Walnut Grove, Calif.

Editor, QST—

Reports have been received here of certain fellows doubting calls heard at this station as published in various numbers of QST. I wish to state that in every case of reported signals I have copied station being called, parts of conversation, as well noting time, wave, spark note, and have letters from every one stating my reception correct. Every one has been heard at least twice, altho in most cases the same night. I have heard and copied during last winter the following L. D. stations: 8ZA, 8ZR, 9AEG, 9HI, 9LR, 9YW, 9EL. This was done on a single tube, as the first amplifier is just working in this station. I am forty miles northeast of San Francisco, and as stated before I have positive data on above, so here is something for the critics to think about.

Hoping this letter finds space in QST, I remain,

J. V. Wise, Radio 6ZX, ex-6EJ.

### Impedance-Coupled Amplifiers

93 California St.,  
Ridgewood, N. J.

Editor, QST—

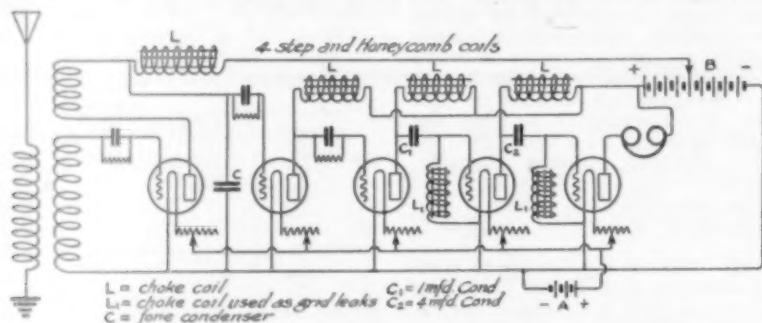
Dear Sir:

Ever since you "razzed" a choke coil amplifier hookup in November 1920 QST I have been going to write to you. Enclosed are two choke coil amplifier hookups which gave excellent results at stations 2AGF, 2BBB and 2AUG all last winter. As far as I know, they were originated by 2AGF.

The choke coil is nothing more than the

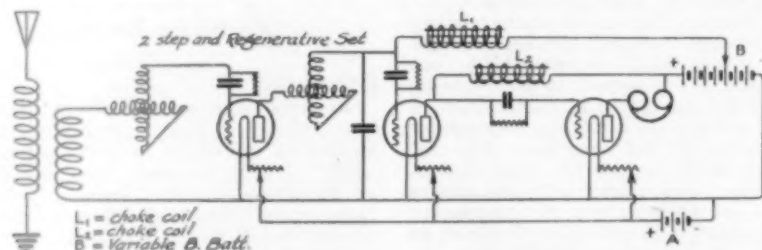
secondary of a spark coil. The spark coil secondary can be almost any size from a  $\frac{1}{2}$ " to a 6", and give good results. A good iron core is necessary. The primary is not used and may be removed if desired.

2UD believes that by placing a potentiometer across the filament battery and using the moving contact for the negative end of the plate battery, the potential on the plate will be the difference between



On an indoor aerial, honeycomb coils and choke coil two (2) strong 800 amateur stations were logged at 2AUG from October, 1920 to April, 1921. That includes 100

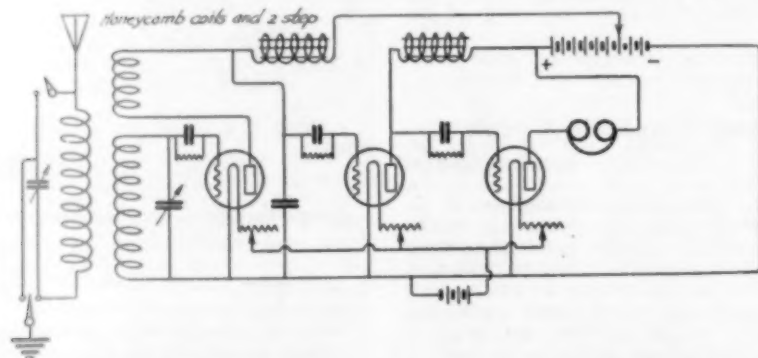
the filament and plate potential. Indications seem to show that the two potentials add instead of subtract. It is rather difficult to prove this with a three element



"nines," 200 "eights," 5ZA, and 14 stations in N. Dak., S. Dak., Neb., Kans., Texas and New Mex. Howzat, OM?

Hamfully.  
 P. Jessup, 2AUG.

tube but by using a two element tube with a sensitive ammeter it will be found that with no external plate potential when the plate connection is returned to the negative end of the filament no current will flow



### "A" Battery Potentiometers

Schnectady, N. Y.

Editor, QST—

Permit me to correct the article written by 2UD in the February issue, on page 46.

to the plate but by sliding the potentiometer or returning the plate connection to the positive side of the filament current will flow to the plate. When using the potentiometer across the filament current will start to flow the instant the contact

leaves the negative end thus showing that the plate potential without an external plate voltage is equal to the potential drop across the filament so when the plate battery is used and returned to the positive side of the filament the total plate potential is the sum of the two.

Nevertheless this no doubt is a simple way to vary the plate potential providing the tube characteristic permits the increase.

Truly yours,  
H. I. Becker, 2HI.

### Co-operation With Utilities Companies

Are any of the A.R.R.L. members having trouble with the electric light companies because of blinking of the lights when they are sending? If they are having trouble, who is at fault?

The electrical journals have been carrying articles and comments on the amateur radio situation. One of the very prominent journals recently had an article showing the status of one electric company. It was the policy of that company to require amateurs to pay for the installation charge of the separate transformer to supply their needs. This company took the stand that the amateur was a real nuisance, but one which had to be tolerated. But in this toleration, the amateur should bear all of the expense.

In the last year the number of amateur stations has increased so remarkably that the electric light companies have been obliged to take note of the situation. They have come to recognize the amateur problem. Whether or not this problem is to be solved amicably to all concerned depends not only on the electric light companies, but also on the amateurs themselves. If the amateurs take a passive or even a hostile attitude in this matter, it is certain that the electric companies are going to settle things to suit themselves.

Now is the time for the amateur to come forward and impress on the electric companies that he is not a dangerous individual, but intends to be law-abiding. He should show that the amateur is one who favors electric service. He is usually of the type who advocates electric heating appliances and electric power-driven machinery. Even though he is a passing danger spot, he should impress upon the electric companies that he is really a potential asset.

In a recent communication to one of the electrical journals, I have suggested that the electric companies would do well to find someone in their organization who is a radio enthusiast. This man should be trained to bring about cordial relations between the amateur and the company. I would like to suggest at this time if there are any A.R.R.L. members who are work-

ing for electric light companies that they see if they cannot bring this about in their own company. It would, also, be well for local clubs to take this matter up actively and see if they cannot come to some satisfactory understanding with the company in their district.

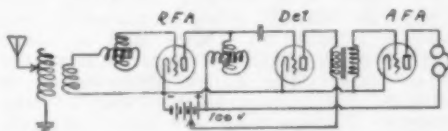
Yours very truly,  
General Radio Company.  
H. B. Richmond,  
Commercial Manager.

### Radio Frequency Amplification

206 East 36th St.,  
New York.

Editor, QST—

Just finished reading the article in August QST on Radio Amplification and think it a good idea to give you some "dope" on the radio frequency amplifier I am using. A diagram of the connections is enclosed. You will notice that it is the well-known tuned impedance type used in



conjunction with one stage of A.F. amplification. Altho well-known, I don't believe that it is used as much as it should be in A.R.R.L. stations. Its superiority over the two step A.F. type may be summed up as follows:

First, it requires but one amplifying transformer and the R.F. stage requires no additional equipment other than the ordinary regenerative (variometer) set.

Secondly, it is quiet in operation because regeneration is not secured by the utilization of a noisy detector tube and because but one stage of A.F. is used.

Thirdly, it is ideal for receiving C.W. since by the proper adjustment of the filament current of the R.F. tube, the latter will oscillate strongly which tends to eliminate the QRM from spark stations as well as the QRN.

Last but not least, it eliminates QRM because it is tuned.

As for the results, the writer has had the set working but two weeks and during that time has heard a countless number of 1s, 2s, 3s, 8s, and a few 4s, and 9s (4GL, 4XK, 4EA, 9UH, 9QM, 9ME.) This was done during the latter part of July and beginning of August and I guess is as good as any two step A.F. set can do. The 4th and 9th district stations could, in most cases, be read thru the QRM around New York which, the experienced will realize, is no small achievement.

Yours sincerely,  
James Wood, 2ALG.

### Scout Work

Boy Scouts of America,  
Fifth Avenue Bldg.,  
New York.

My dear Mr. Maxim:

The Boy Scouts of America desire to express to the First National Convention of the American Radio Relay League their appreciation of the co-operation which you and many members of the League have given in developing the opportunity given to the Scout organization by the United States Navy.

By broadcasting from NAH, the New York naval station, official messages from the National Council to the local organizations of the Boy Scouts, the Navy has made it possible for the Boy Scouts organization to become a channel through which the entire country could receive an emergency communication from our government in Washington hours sooner than it could be delivered by any other means.

We have over 400,000 members with troops in almost every community and Pioneer Scouts on farms and in other isolated places. Every Scout learns the Morse code. The entire organization is available for government service at any moment. League members have rendered, and many more could render, most valuable public service by accepting the responsibility for receiving the broadcasts from NAH and relaying them so that they may be received by Scouts having only mineral detector sets or delivering them promptly in writing or by telephone to the local headquarters of the Scout organization.

The official Scout messages are transmitted on 1500 meters, spark, at about 9:30 P.M. 75th meridian (Eastern Standard) time in connection with the Amateur Broadcast of the Navy Radio Amateur Bureau. The speed is about ten words per minute.

As a member of the League and as a Boy Scout official, I ask that League members everywhere do everything possible to promote this system. No other organization of radio amateurs in America is better prepared with efficient stations and technical ability and public spirit to serve our Government and the public in this matter.

I shall be glad to see that any League member who wishes to be registered with the Navy Radio Amateur Bureau is placed on the records. Any member who serves as an official Boy Scout operator and attains a speed of twenty words per minute is entitled to one of the first one hundred numbers on the Navy's list of amateurs. This is an honor which will be increasingly appreciated as the years go by.

Yours for Radio,  
Armstrong Perry,  
Seascope Radio Commodore.

### Keep the Station On the Air

180 Broad St.,  
Ridgewood, N. J.

Editor, QST—

It seems in some sections of the country possessing only one good relay station where considerable traffic is handled, when this station is closed due to owner making a business trip or while catching up on lost sleep, traffic is completely delayed, unless some other route affords a chance to clear. As this is not always the case, what happens? Traffic hangs on the hook for a week or two and in disgust for not being able to clear it finds its way to the waste basket.

Why wouldn't it be a good idea for owners of these necessary DX relay stations to leave them in charge of one or two assistants—some competent amateur operators in his own town to whom he is personally well known?

Arrangement of details and settlement of any differences which might arise could easily be arranged. There are many amateur operators in towns capable of handling a good DX relay station although not possessing one of their own due to location or inability to finance a station of this kind.

There were three operators at this station all during last winter; no difficulties were experienced. A set evening of watch for each operator, and his other engagements he made accordingly. Of course this sounds commercial-like but any fellow with real interest in the game ought to be willing to devote himself in this way. Besides there was nothing compulsory.

Yours very truly,  
Frederick B. Ostman, 20M.

### The Police are Appreciative

City of Portland, Oregon,  
Department of Public Safety,  
Geo. L. Baker, Commissioner.  
Bureau of Police,  
July 26, 1921.

Mr. R. T. Galyean,  
Acting Div. Manager, A.R.R.L.  
460 Miller St.,  
Portland, Ore.

Dear Sir:

At this time I would like to thank you for the splendid work that you are doing for the Auto Theft Division.

You are certainly helping us in our line of work and I certainly appreciate your co-operation.

With your aid we are better able to get communications and help from different stations surrounding Portland.

Where it used to take us several hours before the different cities received notice of a stolen car these cities receive notification just a few minutes after the car is stolen since you have inaugurated the sys-



tem of sending these notices out by wireless.  
If we can do anything in the future to help you do not fail to call on us.

Yours truly,  
L. V. Jenkins,  
Chief of Police.  
By Lieut. H. A. Phatchers,  
Auto Theft Bureau.

### Electrolytic Rectifiers

1343 Clifton St.,  
Washington, D. C.

Editor, QST:

In nearly all the articles I have seen describing a circuit with electrolytic rectifiers for plate voltage they use a system like Fig. 1.

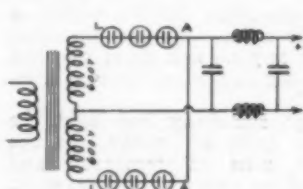


FIG 1

This may be all right for transformers with two secondaries, but if I were building my own I believe I'd rather wind only one secondary and use the old bridge connection for the rectifier cells shown in Fig. 2.

The additional cells may or may not cost less than an additional secondary, but where one builds his own apparatus I think it would certainly be easier to build a few extra cells than to wind some 5,000 or 6,000 more turns of fine wire.

Very truly yours,  
C. Chandlee Pidgeon.

### Proposing a New License System

1101 Climax St.,  
Lansing, Mich.

Editor, QST—

What is amateur radio going to come to at its present rate of increase? Don't you think that the ARRL should begin to take note of the future of amateur radio and propose some form of regulation before some one else does it for us? How long can we exist without adequate means of regulation at our present rate of increase? The Inspectors can't keep up with writing licenses, let alone enforcing the laws. Some one has suggested making a charge for licenses. I am in favor of such a plan but would go a step further and put amateur radio on a sounder basis by providing for an incentive for progress. At present with a little cash John Doe can set up a 1 KW station and for a month or two until he tires of it, keep Pete Jones who has been

following radio since 1912 up till all hours waiting for a chance to do something. I believe the following would do away with a large number of our cases of interference by ignorance and make our big stations what they should be, efficient from the operating as well as the equipment standpoint.

1. Require all receiving stations to have a license. License would hold no restrictions but simply provide for part 2. A charge of say one dollar might be made to cover expenses.

2. Provide a 2nd class amateur license which would be issued to any one holding a second grade amateur license as at present AFTER he had held a receiving station license for a period of say 8 months.

The wave length to be 175 meters and power not to exceed 50 watts. Charge two dollars.

3. Provide a 1st class amateur license requiring 2nd grade commercial license for operator, to be issued to anyone who has held an amateur 2nd class station license for a period of 1 year. The wave length to be 225 meters and power not to exceed 1 KW. (I believe if the max. power were cut to 660 watts it would solve a lot of the power company difficulties and with the present receiving equipment we could well afford to reduce power.) Charge five dollars for license and two dollars for renewal.

4. Special licenses already require 2 years experience on the part of the operator so no change would be necessary here. Same or greater license charge than for (3) above.

With such a system we could have adequate inspection of stations and operators and an incentive to carry a beginner past the ham stage by rewarding his efforts with increased privileges.

I will suggest you canvass this idea among the ARRL members and if favorable start a movement toward getting it enacted into law.

Very truly yours,  
M. H. Pancost, 8ZF.

[Editor's Note—This is not the first time that a system of graded amateur licenses has been proposed. To our mind the system has much that is desirable in the way of potential improvement of conditions on the air, but unfortunately it involves an increase in the inspection and examination expenses that makes the Department feel that it can not be considered at this time. The success of such schemes depends on the rigid observance of the wave length divisions by the different classes, the be-

ginners working on the shorter waves where their embryo efforts will not paralyze advanced work, and it will be realized at once that beginners are not capable of such observance without the benefit of frequent personal inspection visits, and such a visit of an inspector would be necessary each time the amateur went up a notch in the scale. The only way we see by which such a scheme might be put into effect would be the recognition of capable amateurs in every community as Deputy Inspectors, serving without compensation from the government but clothed with the proper authority and charged with the duty of regular inspection of stations in their community. The A.R.R.L. has already made such a proposal to the Dept. of Commerce and is ready to co-operate fully whenever the Department feels it can accept our proposal.]

### Transformer Hams

2407 Valentine Ave.,  
New York, N. Y.

Editor, QST—

Of course we have all heard about the QRM menace and what will happen if we don't watch out. And it is only natural that the spark coil should be accused as the cause of it all, for the reason that there are at least twice as many "squeak boxes" as any other form of transmitter.

And who does all the complaining but the big 1 KW hams. To my mind most fellows to-day with from ½ to 1 KW sets are more ignorant of them, comparatively speaking, than is the little fellow with the one inch. In spite of all the technical articles being written and books published on the subject of adjusting transmitters in general and obtaining a sharp wave in particular, it is painful to sit in night after night and listen to some of the slush from the transformer boys with more money than brains. They make a big noise and that is all they seem to care about. Sigs may come and sigs may go but theirs go on forever. It matters not that a DX station on the next block really has business to be put thru.

Sufficient unto himself is the transformer ham—or words to that effect. Has not father just presented his darling boy with \$100 which he invested in radio? Of course it has to be transmitter. He couldn't put it into a good receiver. They never do. Maybe this is why they call and complain that they are never called. As the O.M. would say—oh spit!

I notice these spark coil prohibitionists, at the end of their articles, always present us with a nice little working schedule. A typical one follows:

7:00 P.M. to 9:00 P.M.—

Local work and testing.

9:00 P.M. to 6:00 A.M.—

DX—no local work.

6:00 A.M. to 7:00 P.M.—Free air.

The only reference to spark coils is a negative one. They are not allowed to transmit after a certain hour reserved for DX. Which is as it should be.

But what gets me is this—Why don't they ever protect the squeak boxes in the same way? Why not prohibit using a transformer in the time reserved for local work? Is there not a law regulating the amount of power to be used under these very conditions? I believe there is.

We have all heard the big fellow zooming along on full power talking to a friend on the next block. What could be sweeter—for him?

But think of the little fellows within a radius of 15 to 20 miles. How in the name of fair play can anyone ask them to QRX so that the same big fellow may amuse himself some more?

Another thing: somebody has said the spark-coil-crystal boys of to-day are the transformer-bulb men of tomorrow and they should be given every encouragement.

This letter may have a reddish tinge but on the other hand some that I have read were altogether too imperialistic.

Well o.m., I feel a whole lot better now. It's a lucky thing for a lot of us fellows that we can talk to you. If I hadn't got this off my chest just when I did, there is no telling what might have happened. And I haven't any cat to spit on either.

Just a suggestion—

6 P.M. to 10 P.M.—local work, low power.

10 P.M. to 6 A.M.—DX, no local work.

6 A.M. to 6 P.M.—

local work and testing, any power.

C. W. Copping.

[Editor's Note: C.W. (we like his initials) is right. Let us call to everyone's attention the fact that it is positively illegal to use high power for short distance work. The law prescribes that the radiated power shall be the minimum necessary for communication. Using a DX transmitter to chew locally simply because it isn't convenient to reduce power, then, is a direct violation of law; and in localities having divisions of hours a high-powered station simply shouldn't be operated during "local" hours.

We again direct attention to the Chicago Plan, fully outlined in May QST, which seems to make equitable provision for all the existing classes of amateurs. Co-operative arrangements like this are proving successful and are daily becoming more necessary.

As to local work, we think that every transformer set that can't QRP should have a spark coil. We often hear two fellows localing in towns 600 miles away, and it's a shame! Other ways of reducing

output for local work are to have a hinged O.T. which will swing open easily and be quickly returned to its normal position for DX, or the use of reduced input and the operation of the rotary as a fixed gap.]

### Southern New England Traffic Conference.

Last-minute word reaches us that the annual A.R.R.L. conference of traffic men in Southern New England, voted last year at Worcester to be held this time in Springfield, Mass., will take place at the Highland Hotel, Hillman St., in the latter city, on Saturday Nov. 26th, two days after Thanksgiving, under the auspices of the Executive Radio Council of Western Massachusetts.

The business meeting will convene at 2 p.m., for the discussion of general operating problems. A visit will be made to the Westinghouse broadcasting station if time permits. A banquet will be held at the hotel at 7:30 p.m., reservations \$2.50 a plate.

A. S. McLean, 585 Armory St., Springfield, is Chairman of the Council. For hotel or banquet reservations and general information address the corresponding secretary, George Marois, 35 College St., Springfield.

These meetings have always been successful. Let's make this one the biggest and best yet. Everybody come.

### CORRECTION

In the advertisement of the Radio Corporation of America on page 85 of QST for September, the price of their new catalog is illegible due to poor printing. The amount is twenty-five cents.

### CALLS HEARD

(Continued from page 53)

Sparks—Can. 3BP. Can. 4BG. 5EK. 5EW. 5FV. 5HK. 5IR. 5LO. 5NK. 5NS. 5QS. 5XB. 5XJ. 5ZA. 5ZC. 5ZL. 6AEZ. 7DH. 7LU. 7LY. 7MO. 7MP. 7XD. 7ZG. 7ZM. 7ZO. 8DZ. 8EA. 8HU. 8ID. 8TK. 8UC. 8WY. 8YN. 8ZN. 8ZR. 8AC. 8AF. 8AFS. 8AIB. 8AIC. 8AYN. 8AYS. 8AAE. 8AAW. 8ACB. 8ACN. 8AC. 8AEG. 8AEQ. 8AEY. 8AFC. 8AFF. 8AFW. 8AFX. 8AGN. 8AHZ. 8ALH. 8ALK. 8AKC. 8AMK. 8AMS. 8ANF. 8ANO. 8ANQ. 8AOJ. 8AOU. 8AOZ. 8APW. 8AQM. 8ARZ. 8ASN. 8AXU. 8AYU. 8AYW. 8AYY. 8BP. 8CP. 8CS. 8DEH. 8DFL. 8DFR. 8DJX. 8DKR. 8DNC. 8DOC. 8DOF. 8DSL. 8DTC. 8DUG. 8DUI. 8DUZ. 8DWM. 8DWP. 8DZJ. 8DZL. 8EL. 8ET. 8EW. 8FC. 8FS. 8FZ. 8GC. 8GN. 8HM. 8JN. 8KA. 8KO. 8MC. 8ME. 8MS. 8NQ. 8PC. 8PI. 8PN. 8PS. 8TB. 8TI. 8TO. 8TV. 8UU. 8VK. 8VL. 8WI. 8XAE. 8YA. 8YAC. 8YAK. 8YM. 8YO. 8YT. 8ZAB. 8ZAC. 8ZB. 8ZC. 8ZJ. 8ZN. 8ZU. 8ZV.

9CR, Chicago, Ill.

Armstrong Superheterodyne. All Districts  
C.W.—10E. 1TS. 1ANQ. 1CAK. 1DAD. 2FP. 2OE.

2AWL. 2XA. 2ZL. 2ZV. 3HG. 3HX. 3AAE. XF-1. 4GL. 6WV. 8NQ (dalite). 8ACF. 8AIO. 8DE. 8BPL. 8VY (dalite). 8GO. 8KM. 8IQ. 8XV. 8ZB. 8JQ. 8BP. 8XK. 8BK. 8XA. 9AUL. 9VE. 9ABU.

Spark—1ZE. 2FP. 2OM. 3HX. 3PB. 3XF. 4BQ. 4EY. 4ZA. 5DA. 5EK. 5FV. 5HK. 5XF. 5ZL. 7ZM. 8FT (dalite). 8XS. 8IN. 8BZ. 8HU. 8ARS. 8EA. 8EB. 8EZ. 8ZA. 8ZAA. 8WY. 8BU. 8CF. 8AYN. 8BDY. 8UC. 8BK. 8XA. 8RQ. 8AGK. 8AYS. 8AFD. 8AFS. 8ZN. 8AWP. 8ANO. 8ACY. 8SP. 8IK. 8VR. 8ZD. 8EE. 8JN. 8YA. 8YM. 8YAC. 8YAK. 8XI. 8XM. 8HM. 8XAE. 8AOU. 8ACB. 8AEG. 8ANF. 8ANP. 8AFW. 8ZAC. 8ZC. 8ZB. 8APW. 8ZU. and plenty other 9's.

### 9ZY, La Crosse, Wis.

1TS. 2FP. 2AWL. 3AAE. 3BZ. 5AR. 5HK. 5LO. 5NA. 5UV. (5XJ). 5ZA. 5ZL. (6WV). 8ACF. 8AGG. 8AIO. (8AYN). 8BK. 8BO. 8CF. 8DE. 8DR. 8DW. 8DX. 8DZ. (8II). 8IV. 8JQ. 8KM. 8LV. (8NQ). 8OH. 8QY. 8UK. (8VY). 8WA. 8WY. 8XK. 8ZR. 8ZZ. (9AMB). 9AYW. (9ARZ). 9AAW. 9AEG. 9APN. 9AEY. 9AAP. (9ABU). 9AKC. 9AZX. 9AAV. 9AHZ. (9AWZ). (9AJA). 9AOU. (9AXU). 9ARK. 9ARD. 9AOW. 9ASD. 9ANF. 9ANE. 9DOF. (9DEH). (9ARK). 9DP. 9DBU. (9DUG). 9EK. (9FS). 9GN. 9 \* . 9KA. 9LG. 9MC. 9PS. (9RY). (9UU). 9VE. 9XI. 9YA. 9YAK. 9YN. 9ZA. (9ZAC). (9ZC). 9ZJ. 9ZN.

### 9AAS, Owensboro, Ky.

1AW. 1FP. 1TS. 2AW. 2WL. 2ZV. 2AJA. 2AWL. 3BZ. 3XY. 4BQ. 4FD. 4GL. 4GN. 4ZF. 5DA. 5FH. 5FV. 5GL. 5HK. 5UV. 5AAE. 6WV. 8AZ. 9BK. 8BO. 8BP. 8DE. 8DR. 8EX. 8EA. 8FB. 8FK. 8IV. 8IQ. 8KY. 8SK. 8OH. 8PN. 8SP. 8UK. 8VY. 8WA. 8WR. 8WY. 8XE. 8ZA. 8ZI. 8ZN. 8AAL. 8ABO. 8ACF. 8ADQ. 8ADY. 8AFD. 8AFT. 8AJV. 8AQV. 8ARD. 8AVW. 8BDU. 8BOW. 8BRC. 8TCF. 9AJ. 9FW. 9GO. 9HM. 9LQ. 9MC. 9WR. 9XM. 9ZN. 9ZY. 9ABU. 9AEG. 9DWM.

### 9ME, Fort Wayne, Indiana.

Spark—1ABL. 1ACK. 1ARY. 1AZJ. 1BDC. 1BGF. 1BY. 1CAJ. 1CAN. 1CK. 1SN. 2AC. 2AJA. 2AJE. 2AQU. 2AQL. (2BK). 2DA. (2AWL). 2DW. (2EL). (Can. 2FP). 2FJ. 2IG. 2GR. 2JU. 2KL. 2KM. (2OM). (2RM). 2RP. (2WB). (3AC). (3AQR). 3BFA. 3BFU. (Can. 3BP). 3CC. 3EM. (3HJ). 4AR. (4BQ). (4DH). 4EY. 4FD. 4GL. (4GN). (3IW). 3KM. 3PP. 3UH. 3UX. 3VJ. (3XF). 3XM. 4UJ. 4XC. 4XK. 5DA. 5ED. 5EK. 5EP. 5ER. (5FV). 5HK. 5LO. 5OK. 5ZL. 5ZX. 5ACF. 8ACY. (8ADO). 8AEU. (8AFD). (8AFH). 8AFS. (8AGR). (8AGK). 8AGO. 8AIB. 8AIL. 8AIO. 8AJN. (8AKY). (8MB). 8AMQ. 8ANF. (8ANI). 8ANK. 8ANU. 8ANW. 8ANZ. 8APB. 8AQN. 8AQR. 8AQV. 8ARD. (8ARS). 8AVT. 8AWP. 8AWU. 8AXC. (8AYN). (8AY). (8AYS). 8AYV. 8AZF. 8BAA. (8BAS). 8BBU. 8BC. 8BCO. 8BDO. 8BDP. 8BDY. (8BEP). (8BK). 8BKO. (8BO). (8BP). 8BRL. 8CD. 8CF. (8CH). (8CP). (8DR). (8DZ). 8EA. 8EB. 8EC. 8BOY. 8EV. 8EZ. 8FB. 8FQ. 8FR. 8FE. 8FT. (8JL). 8GN. (8GO). 8HU. (8IN). 8IFR. 8IUI. 8IQ. 8JB. 8JU. 8LH. 8MM. 8MZ. 8NZ. 8NQ. 8OI. 8OV. 8PM. 8QC. 8QR. 8RM. (8RQ). 8RU. 8PU. (8SP). (8TK). 8TN. (8TT). (8TY). (8TZ). (8UC). 8UP. 8VC. 8VG. 8VQ. 8VR. (8WA). 8WO. 8WU. 8XC. 8XE. 8XM. 8YN. 8ZA. 8ZB. (8ZD). 8ZR. 8ZU. 8ZZ. (9AAW). (9ABH). (9ABS). 9ABU. 9AC. 9ACE. 9ACL. 9ACN. (9ACY). 9ACZ. 9AEF. 9AEG. 9AFI. 9AFX. (9AGO). (9AGR). 9AGV. 9AIR. 9AJH. 9AMK. 9AMS. 9AMT. 9ANP. 9AOU. 9AOV. 9APK. 9APL. 9AOA. 9AQM. 9AGR. 9AMV. 9ARN. 9ARZ. 9ARX. 9ASN. 9ATN. (9AUC). (9AWU). (9AWZ). 9AXG. 9AWU. 9AYE. 9AYW. 9AYY. 9AZA. 9AZF. 9BDR. 9BP. 9CF. 9CI. (9CP). 9CS. 9DCV. 9DFA. 9DFL. 9DFR. 9DII. 9DOI. 9DON. 9DP. 9DTC. 9DUG. (9DWM). 9DWP. 9EE. 9FN. (9FS). 9GN. 9GO. (9GX). 9HM. (9HR). 9IJ. 9JN. 9KM. 9KO. 9MC. 9MJ. 9MS. 9NC. (9OX). 9PS. 9QH. 9RB. 9UC. (9UH). 9UM. (9UU). 9VL. (9VZ). 9ZAC. 9ZC. 9ZAD. 9ZJ. 9ZL. (9ZN). 9ZR. 9WT. 9WI. 9XJ. 9YAK. 9YW. 9YS.

C.W.—1AZJ. 2AFP. 2AJA. 2AJW. (2AWL). 2BAK. 2BGH. 2DN. (2FP). 2FS. 2GR. 2KL. 3BZ. 3CC.

8AWL, 3HG, 3SP, 4BQ, 4FF, 4GL, 5DA, 8ACF, 8AGO, 8AHH, 8AHZ, 8AIO, 8CF, (8DE), (8DZ), (8DR), 8GF, 8HJ, (8II), 8IQ, 8IV, (8JA), 8LB, 8LF, 8NQ, 8QY, 8VY, 8AL, 8ZR, 8ZZ, 8XV, 9AAV, 9AJA, 9AZX, 9KM, 9UC, 9UD, 9ZAE, 9ZY.

#### 9DUG, Hutchinson, Kansas

(5DW), (5EK), (5EU), (5FO), (5HK), (5HL), (5HZ), (5IR), (5JD), (5LC), (5LO), (5NF), (5NK), (5NS), (5PU), (5QH), (5QI), (5QS), (5XJ), (5YH), (5ZA), (5ZAG), (5ZU), (6WV), (6ZZ), (7ZO), (8AIO), (8ID), (9AEG), (9AEQ), (9AEY), (9AFW), (9AKC), (9AMA), (9AMB), (9ANF), (9APW), (9AQM), (9ASN), (9ACB), (9ASK), (9AUO), (9AYY), (9ARZ), (9AXU), (9ET), (9FZ), (9GN), (9HM), (9HT), (9IY), (9KA), (9KO), (9MC), (9NQ), (9OO), (9PS), (9UU), (9VE), (9WI), (9YAK), (9ZAC), (9ZB), (9ZC), (9ZN), (9ZY), (9DEH), (9DTP), (9DZJ), (9DZR).

#### 9EW, Omaha, Nebr.

4CB, 5EK, 5HK, 5LW, 5XB, 5ZA, 6WV, 7MP, 7XD, 8DE, 8VK, 8VY, 9BP, 9CN, 9EE, 9HM, 9KA, 9MC, 9MS, 9PN, 9PS, 9RY, 9UU, 9XL, 9YA, 9YM, 9YO, 9ZB, 9ZC, 9ZH, 9ZN, 9ZU, 9ZY, 9AAW, 9ABU, 9ABV, 9AEG, 9AEY, 9AGN, 9AHZ, 9AJP, 9AKC, 9AYW, 9AYZ, 9BBS, 9DEH, 9DFL, 9DSG, 9DTU, 9DUG, 9YAC, 9YAK, 9ZAC.

#### 9AYS, Lincoln, Neb.

5CL, 5EK, 5ER, 5EV, 5HK, 5HZ, 5IR, 5JS, 5KS, 5LA, 5LO, 5MA, 5NS, 5QA, 5QE, 5QS, 5XI, 5XJ, 5ZA, 5ZL, 5ZO, 6ZX, 7HK, 7HL, 7LK, 8AK, 8NL, 8HL, 9AK, 9AAW, 9AEG, 9ABV, 9ACB, 9ACK, 9AFX, 9AIS, 9AFF, 9AIO, 9AMK, 9ANF, 9AOU, 9AOW, 9APN, 9APP, 9ARW, 9ASJ, 9AYW, 9AWZ, 9DP, 9DQ, 9DEE, 9DEH, 9DFL, 9DCG, 9DIL, 9DUG, 9DVP, 9DWM, 9DVM, 9EE, 9EL, 9ET, 9GN, 9HM, 9HN, 9HP, 9KA, 9KO, 9LC, 9MG, 9MS, 9OE, 9OU, 9PN, 9PS, 9RG, 9QF, 9TO, 9UU, 9VE, 9WL, 9WS, 9XI, 9XJ, 9XM, 9YA, 9YB, 9YAK, 9YK, 9YM, 9YO, 9ZA, 9ZAC, 9ZB, 9ZC, 9ZF, 9ZH, 9ZL, 9ZN, 9ZU, 9ZY.

#### 9ARZ, Clear Lake, Iowa

Canadian 3BP, 4BQ, (5EK), 5EU, 5HK, 5JR, 5LA, 5LC, 5LO, 5XJ, 5ZA, 5ZL, 6WV, 7XD, 8BO, 8CF, 8DE, 8II, 8IV, 8KY, 9JM, 8NQ, 8PM, 8QJ, 8TT, 8VY, 8WA, 8WY, 8XV, 8YN, 8ZA, 8ZL, 8ZN, 8AFD, 8AGK, 8AYN, 8AYS, 8BEF, 8IQA, nines too numerous.

#### 9DWK, Jackson, Mo.

1DAD, 2ZL, 2AFP, 3AC, 3EL, 3BZ, 3ZY, 4BQ, 4DH, 4GL, 4XC, 4XK, 5AF, 5DA, 5PH, 5EK, 5ER, 5FV, 5HK, 5HZ, 5LO, 5QL, 5QS, 5XB, 5XI, 5XK, 5ZA, 5ZL, 5ZM, 6WV, 5BK, 5BO, 8DE, 8DR, 8DX, 8EA, 8IQ, 8JQ, 8KM, 8NQ, 8OI, 8PN, 8SP, 8TK, 8TT, 8UJ, 8VK, 8VY, 8WY, 8XK, 8XV, 8XY, 8YN, 8ZR, 8ZU, 8ZZ, 8AAZ, 8ACF, 8ACY, 8ADY, 8AEZ, 8AFD, 8AQF, 8ARV, 8AYN, 8BBU, 8BCI, 8BRC, 8FS, 8HM, 8JN, 8LQ, 8MC, 8WE, 8MS, 8PH, 8PS, 8QM, 8TV, 8UU, 8WL, 8XL, 8XM, 8YA, 8UB, 8YM, 8ZL, 8ZY, 9AAW, 9ABH, 9ABV, 9ACL, 9ACN, 9AEG, 9AEY, 9AFX, 9AJW, 9AKC, 9ALB, 9AOU, 9ARX, 9ARZ, 9AWX, 9AYK, 9AYW, 9DIL, 9DFL, 9DLX, 9DQ, 9DE, 9DUG, 9DWM, 9MEY, 9YAK, 9ZAC, Can. 3BP.

#### 9DCN, Kansas City, Mo.

2FP, 2RW, 4BQ, 4GL, 5AIO, 5EF, 5EK, 5FK, 5FV, 5HK, 5HZ, 5IR, 5JF, 5LC, 5NS, 5QH, 5SK, 5SU, 5XJ, 5ZA, 5ZAN, 5ZL, 7XD, 8AIO, 8AIV, 8BW, 8DE, 8IC, 8JQ, 8LX, 8NQ, 8RV, 8YN, 9AAP, 9ACN, 9AEG, 9ACB, 9AF, 9AFF, 9AFW, 9AFX, 9AAW, 9AHK, 9AHZ, 9AKW, 9AQR, 9ARP, 9ARZ, 9ASD, 9AE, 9AOU, 9AVN, 9AXI, 9AYW, 9BK, 9CF, 9ASN, 9AVS, 9DVB, (9DKX), 9DOU, 9DPE, 9DPL, 9DAV, 9DFE, 9DJB, (9DKX), 9DOU, 9DPE, 9DPL, 9DQ, 9DRQ, 9DUG, 9DZL, 9EE, 9ET, 9GM, 9GN, 9HM, 9JN, 9KP, 9SV, 9NC, 9OK, 9OR, 9OX, 9MR, 9PS, 9RY, 9SY, 9UU, 9VR, 9WI, 9XAB, 9XI, 9XM, 9XX, 9YA, 9YAC, 9YAK, 9YM, 9YO, 9ZAC, 9ZAD, 9ZB, 9ZH, 9ZN, 9ZQ, 9ZY.

#### 9DBU, Eden, Ill.

4AS, 4CG, 4GL, (5EK), 5ER, 5FO, 5FV, 5HK, 5JR, 5JD, 5KK, 5NK, 5RH, 5RQ, 5RZ, 5YN, 5ZA,

(5ZL), 5VZ, 8FI, 8OI, 8UR, 8YN, 8ZA, 8APB, (8APP), 9AF, (9AK), (9ET), 9HL, (9MS), 9MC, (9NQ), (9RH), (9LF), 9VK, 9YN, 9AEG, 9AIO, 9ANH, (9AMK), 9AMA, 9APZ, (9AYB), (9DEU), (9DHZ), (9DHF), (9DAY), (9DDY), 9DMP, 9DT, 9DTQ, (9DYY), 9XAK, (9XAF).

#### STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of QST, published monthly at Hartford, Conn. for October 1, 1921.

County of Hartford } ss.  
State of Connecticut }

Before me a Notary Public in and for the State and county aforesaid personally appeared K. B. Warner, who, having been duly sworn according to law, deposes and says that he is the business manager of QST and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The American Radio Relay League, Inc., Hartford, Conn.; Editor, Kenneth B. Warner, Hartford, Conn.; Managing Editor, (none); Business Manager, Kenneth B. Warner, Hartford, Conn.

2. That the owners are: (Give names and addresses of the individual owners, or, if a corporation, give its names and the names and addresses of stockholders owning or holding 1 per cent. or more of the total amount of stock). The American Radio Relay League, Inc., an association without capital stock, incorporated under the laws of the State of Connecticut.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: (If they are none, so state) Edw. Hudanerd, New York, N. Y.; Wm. H. Buffington, Fall River, Mass.; Gordon M. Christine, Philadelphia; Frank Conrad, Pittsburgh, Pa.; H. L. Bantleman, Jr., Yonkers, N. Y.; Walter Rogers, Essex Falls, N. J.; Joe P. Ryneason, Wolf Island, Mo.; Clyde E. Darr, Detroit, Mich.; H. E. Nichols, Bridgeport, Conn.; Ludwig England, Duluth, Minn.; Chas. H. Stewart, St. David's, Pa.; R. H. Parker, Tilton, N. H.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear on the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is..... (This information is required from daily publications only).

K. B. Warner

Sworn to and subscribed before me this 27th day of September, 1921.

F. L. Pratt, Notary Public

(My commission expires February 1, 1924.)



# 32 Long Hours

he wore Brown Phones

HIS SHIP slowly sinks—37 lives depend on him—for 32 hours operator Powell feverishly stuck to his post, while his hand grew numb at the key. At last his heroism was rewarded, and thru the Brown Phones that had become a vital part of his experience, came the strained-for answer to his S.O.S.

Would it be out of place to say that those phones, with their super-sensitive reproducers and extreme light weight (only 9 ounces) at least contributed somewhat to saving those 37 lives? Powell himself says the light weight of his Browns saved him from exhaustion hours

ago.

You can enjoy this same comfort and light weight daily. Brown Phones, with conical aluminum diaphragms and rugged protecting shells, are now for sale at leading radio dealers at these reduced prices:

Type A (adjustable) was \$22.00, now \$18.00

Type D (for phone work) was \$20.00; now \$16.00

(Either type equipped with Five Round Plug for \$1.50 extra)

John Firth and Co. Inc. 18 Broadway, N. Y., Distributors.



# BROWN PHONES

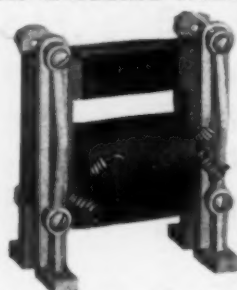
# De Forest Guaranteed Parts for C. W. Apparatus - *Below Cost!*

Acme C.W. Power Transformers



Unmounted. For 60 cycle, 110 volt supply. 3 secondary windings. 6, 12, and 1000 volts, with center tap on high voltage. Designed to furnish 500 volt D. C. when using Standard rectifier tubes. Works efficiently with all makes of tubes \$12.50

Acme A3 Modulation Transformers



On mounting brackets. Exceptionally efficient input transformer for Radio telephone work \$5.00

Inductances for Transmitters



Up to 50 watt capacity. 50 turns of wire wound on threaded formica tube. 7 or 26 positive taps. Proper spacing between turns for maximum efficiency. ....\$2.50

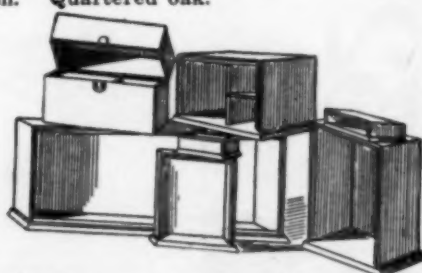
Perfectly Insulated control buttons D.P.D.T.



Push locking type, for battery circuits, transfer switches, etc. ....\$1.50

## DEFOREST CABINETS

Hand rubbed, waxed, early English finish. Quartered oak.



Panel	Size	Cabinet Depth	
7 1/2 inches	7 inches	8 inches	\$3.00
9 1/2 inches	7 inches	9 inches	3.50
7 1/2 inches	11 1/2 inches	6 1/2 inches	3.00
7 1/2 inches	6 inches	2 inches	1.25
7 1/2 inches	7 inches	3 1/2 inches	2.50
18 1/2 inches	11 1/2 inches	7 inches	4.90
11 1/2 inches	11 1/2 inches	6 3/4 inches	4.25
11 1/2 inches	14 inches	6 1/2 inches	5.25
8 3/4 inches	1 1/4 inches	4 inches	1.50
13 1/2 inches	7 inches	10 inches	5.00
9 inches	9 inches	6 1/4 inches	6.75
8 inches	9 inches	6 3/8 inches	5.25
10 1/2 inches	9 inches	6 7/8 inches	5.00
15 inches	9 inches	6 7/8 inches	5.75
14 inches	9 inches	6 7/8 inches	4.00
18 1/2 inches	9 inches	6 7/8 inches	6.25
23 inches	9 inches	6 7/8 inches	7.50
27 1/2 inches	9 inches	6 7/8 inches	9.00
32 inches	9 inches	6 7/8 inches	10.00
8 1/2 inches	17 1/2 inches	18 1/4 inches	7.00
9 1/2 inches	7 inches	4 1/4 inches	3.50
		With hinged cover	
11 1/2 inches	8 inches	4 1/4 inches	2.00
		With hinged cover	
4 1/2 inches	4 1/2 inches	1 3/8 inches	.90

## DE FOREST RADIO TEL. & TEL. CO.

1391 Sedgwick Ave., New York

Inventors and Manufacturers of High Grade Radio Apparatus

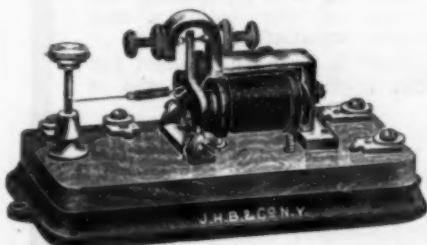
# De Forest Guaranteed Parts for C. W. Apparatus - *Below Cost!*

## Guaranteed ESCO Dynamotors



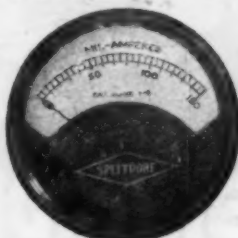
110 Volts D. C. to 500 volts D. C. 100 watts. Ball bearing type; one unit. This is the best possible outfit for C.W. plate supply. Smooth running. Noiseless in operation. Large overload factor of safety. Reduced to **\$65.00**

## Bunnell Relay



Operating on 6 volt battery. Ideal for electro-magnetic transfer switch. .... **\$3.98**

## Guaranteed Standard Indicating Instruments at Manufacturer's Cost



Hot wire ammeters, Gen. Radio, Scale 0-7 **\$7.00**  
Hot Wire ammeters, Gen. Radio scale 0-2 **7.00**  
High Freq. Ammeters, Roller-Smith scale 0-5 **22.50**  
Filament ammeters, R.-S. scale 1.5, 0, 1.5 **8.00**  
Filament ammeters, Weston scale 0, 0-0-1.5 **9.00**  
D. C. Ammeters, Splitdorf scale 0-2 **5.75**  
D. C. Ammeters, Splitdorf scale 0-3 **5.75**  
D. C. Ammeters, Splitdorf scale 0-5 **5.75**  
Hot Wire Ammeters, Gen. Radio scale 0-10 **7.00**  
D. C. Milliammeters, Splitdorf scale 0-150 **5.75**  
D. C. Milliammeters, Gen. Radio, scale 0-250 **7.00**  
Filament ammeters, Amer Everready scale 1.5  
0-1.5 ..... **3.80**

## Guaranteed Standard Makes of Head Telephones Below Cost



Murdock No. 55 —3000 ohms..... **\$4.50**  
Red Heads —3000 ohms..... **7.50**  
Federal No. 53W—2200 ohms..... **7.00**  
Federal No. 52W—3000 ohms..... **9.50**

## DEFOREST DUO-LATERAL COILS

At Lower Cost Than Imitations

### NOTE REDUCED PRICES

The mounting bands have been perfected so they are absolutely impervious to moisture; lower distributed capacity, lower high frequency resistance, and better made in all respects than any other coils of this type now on the market.

DL-25 .....	\$1.40	DL-300 .....	\$1.75
DL-35 .....	1.40	DL-400 .....	1.80
DL-50 .....	1.50	DL-500 .....	2.00
DL-75 .....	1.50	DL-600 .....	2.15
DL-100 .....	1.55	DL-750 .....	2.35
DL-150 .....	1.60	DL-1000 .....	2.60
DL-200 .....	1.65	DL-1250 .....	3.00
DL-250 .....	1.70	DL-1500 .....	3.50

## DE FOREST RADIO TEL. & TEL. CO.

1391 Sedgwick Ave., New York

Inventors and Manufacturers of High Grade Radio Apparatus



## Moderate Prices

The moderate prices of the Brandes Headsets enable all operators to become owners. Three types; \$8, \$12, and \$14; complete, ready for use.

They are not too expensive for Colleges and Universities to install as many outfits as can be used.

Give amateurs a chance to have the best equipment, instead of the ordinary and often unsatisfactory kind.

**CHRISTMAS GIFT**—Give yourself a Brandes Headset for Christmas, or give one to that friend or relative who is interested in wireless.

"Navy" type headset,	\$14.00
"Transatlantic" type headset,	12.00
"Superior" type headset,	8.00

Sold on 10 days trial. Money refunded if not satisfactory.

*Send 5c for Catalog F*

**DEALERS**—write for proposition

**C. BRANDES, INC.**

Room 821, 32 Union Square, New York City.

## Get a Copy of Our Wireless Manual H-12



It contains 200 pages, fully illustrating and describing the many instruments used in Radio service. Forty-five pages are devoted to general instructions, diagrams, station calls, tables, codes and other information identified with the art. The book is printed on highly finished paper with a two-color cover; size 8x5 1/4 inches.

We ask 25 cents for it, give a coupon receipt for the amount which coupon when returned with an order will be credited at 25 cents.

With a large and varied supply of wireless instruments and accessories carried in stock, we are in position to fill any order or meet any condition promptly and accurately.

We have experts in charge of our wireless departments, so do not hesitate to consult us about your wireless problems. Proper attention and accurate information is yours for the asking.

**MANHATTAN ELECTRICAL SUPPLY CO., Inc.**

17 Park Place, New York; 114 So. Wells St., Chicago; 1106 Pine St., St. Louis; 604 Mission St., Frisco



# Shell Type Filament Transformers



PRI. 110 VOLTS

SEC. 10 VOLTS

## FOR C.W.

SECONDARY TAPPED AT CENTRE

1 or 2 50 Watt Tubes	Mounted—\$10.00
1 or 2 50 Watt Tubes	Unmounted—\$ 8.00
4 50 Watt Tubes	Mounted—\$15.00
4 50 Watt Tubes	Unmounted—\$12.50

### AMATEURS:

Change over your type "R" or "RS" spark transformers to high voltage C.W. transformers.

We are prepared to furnish two secondary coils to replace the high voltage winding now on your transformer. Each coil 1500 volts.

Send us your specifications.

Don't forget our popular line of spark transmitting apparatus.

## Thordarson Electric Mfg. Co.

517 S. Jefferson Street.

Chicago



## CORWIN DIALS~reduced

No falling off in sales demanded the price reduction of Corwin Dials.

The high quality of the finished dial, plus their accuracy and ease of operation, would justify the upholding of the present cost.

On the contrary the increased demand by amateurs who know, plus efficient marketing has lowered the cost of production, without impairing the quality. Therefore, we are able to offer Corwin Dials at a much lower price.

OLD PRICES	NEW PRICES	REDUCTION
Number 66.....\$0.75	Number 66.....\$0.60	\$0.15
Number 67.....1.30	Number 67.....1.00	.30
Number 68.....1.00	Number 68......80	.20
Number 69.....1.70	Number 69.....1.20	.50

The distinction Corwin Dials impart to a radio station is only exceeded by their accuracy and ease of operation. Judged by time they are the oldest on the market; judged by design, they are the newest; judged by performance they are the most satisfactory; and judged by price, they are the best value obtainable.

*At all Radisco agencies and other reliable Dealer's or sent postpaid anywhere.*

**A. H. CORWIN & CO.**

4 West Park St., Newark, N. J.

# QST Pittsburgh Amateurs!

You will find us in a position to supply your needs in radio supplies

Westinghouse, Amrad, DeForest, Acme, Murdock, Federal & Brandes  
Complete Antenna and ground equipment.

—PARTS—

Come in and  
See Us  
**QUALITY**

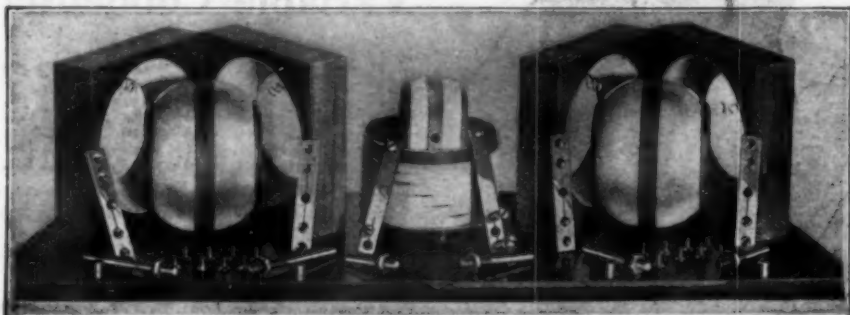
**DEVON**  
ELECTRIC CO. Inc.

Mail Orders  
Promptly Filled  
**SERVICE**

613 LIBERTY AVENUE,

PITTSBURGH, PA.

## Famous "Chi-Rad" K-D Variometer Parts



All parts to build two variometers and one coupler. ALL WINDINGS IN PLACE—nothing to do but screw on bearings and connect up. Complete set can be assembled in 30 minutes. The biggest value on the market—order a set today. Immediate Delivery.

Price complete as shown \$10.00 Add PP on 6 lbs.

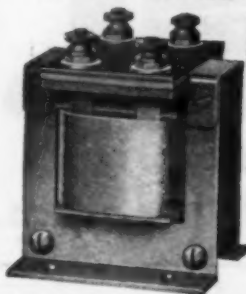
### Specifications

Variometer forms 4 1/2" Sq., 3" wide when assembled. Coupler primary Bakelite 3 1/2" diam., 3 1/2" high. All shafts 1/4" diameter. 7 Primary Taps. Range 150-475 meters. Special condenser to shunt secondary and increase range to 650 meters supplied for 35c extra.

Made specially for-panel mounting—all screws covered by dials when assembled.

Immediate Delivery—Money Back Guarantee.

## NEW THORDARSON AMPLIFYING TRANSFORMER



Price fully mounted as shown

**\$4.00**

Add PP on 1 lb.

Built by the world-famed transformer manufacturers and fully up to the high reputation and standard of all Thordarson products.

### Outstanding Features

- 1—Eight months in building; tested and approved by Bureau of Standards.
- 2—Windings of large size *silk covered* wire, NOT enameled. No burnouts. Proper impedance secured by use of extra large core of shell type.
- 3—Ratio 3 1/2 to 1. Primary and Secondary wound in separate sections and placed side by side on the core, not over each other. This gives most efficient coupling with very low distributed capacity and no tendency to howl even on 6 steps.
- 4—Considering the high standing of the maker and the very moderate price this is unquestionably the best transformer "buy" on the market.

In stock for immediate delivery—orders filled in rotation—send yours today. DEALERS:—Get our special discount on the Thordarson Amplifying Transformer—be the first in your locality to give your customers what they want. The demand will be heavy, place your order early.

**Chicago Radio Apparatus Co., Inc.**

Phone Harrison 1716

**508 SO. DEARBORN STREET,**

**CHICAGO, ILL.**

"Sole Chicago distributor FIRCO Radio Equipment"



## Chelsea Variable Condensers

(Die Cast Type)

No.	Capacity	Type	Size	Weight	Price
1	.0011m.f.	Mounted	4 1/4 x 4 1/2 x 3 1/2	1 1/4 lbs.	\$5.00
2	.0006m.f.	Mounted	4 1/4 x 4 1/2 x 2 1/2	1 1/4 lbs.	4.50
3	.0011m.f.	With Dial	4 1/4 x 3 x 4	2 lbs.	4.75
3	.0011m.f.	Without Dial	4 1/4 x 3 x 4	2 lbs.	4.25
4	.0006m.f.	With Dial	4 1/4 x 3 x 3 1/2	1 1/4 lbs.	4.25
4	.0006m.f.	Without Dial	4 1/4 x 3 x 3 1/2	1 1/4 lbs.	3.85

Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates.

Unmounted types will fit any panel and are equipped with counter-weight.

Purchase from your dealer; if he does not carry it, send to us. Bulletin sent upon request.

## The CHELSEA Amplifying Transformer

is a supreme attainment in the design of Audio Frequency Transformers. It embodies the highest grade of materials obtainable and proper design, which reflects the result attained namely high amplification factor. It is unequalled either in electrical characteristics or good appearance. Price as shown \$4.50



\$4.50

**Chelsea Radio Co , 150 Fifth St., Chelsea, Mass.**

## BI-LATTICE COILS (Duo-Lateral)

For Long Distance Reception This is the Best Type of Inductance.

No. of Turns	Unmounted	Mounted		No. of Turns	Unmounted	Mounted
25	\$0.45	\$1.30	Transportation Prepaid In U. S. A. Our Products Fully Guaranteed	300	\$0.50	\$1.65
35	.45	1.30		400	.90	1.75
50	.50	1.35		500	1.00	1.85
75	.55	1.40		600	1.10	1.95
100	.60	1.45		750	1.30	2.15
150	.65	1.50		1000	1.55	2.40
200	.70	1.55		1250	1.90	2.75
250	.75	1.60		1500	2.35	3.20

Coil Plugs Complete with Fibre Strip \$0.75 each

Set of 3 Mounting Plugs to Make Triple Mounting \$3.00 per set

Send 4c for Bulletin "A" containing valuable data regarding

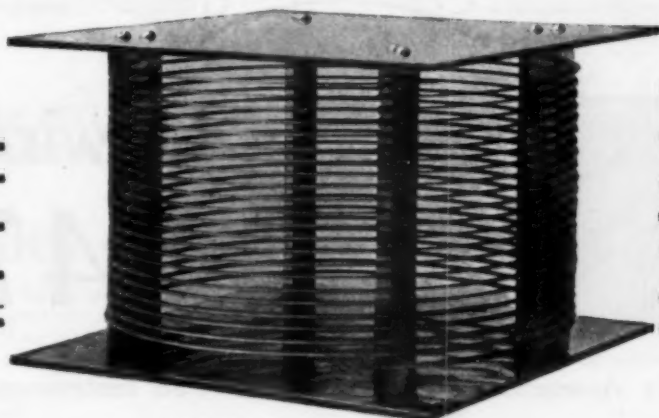
BI-LATTICE COILS for LONG WAVE and SINGLE LAYER COILS for SHORT WAVE RECEPTION.

**P. J. STOCKWELL, Box 157-A, Reading, Massachusetts**



**C-W C-W C-W C-W C-W C-W C-W C-W**

CW Filters  
 CW Plate  
 Transformers  
 CW Condensers  
 CW Filament  
 Transformers  
 CW Iron  
 Core Chokes  
 CW Radio Fre-  
 quency Chokes



CW Power  
 Tubes  
 CW Rectifier  
 Tubes  
 CW Sockets  
 CW Rheostats  
 CW  
 Microphones  
 CW Tone Arms  
 CW Modulation  
 Transformers

**WIMCO CW 100 INDUCTANCE**

Get the **BEST CW Inductance**. Real connection clips provided, no uncertain switches which short circuit turns. Entirely insulated on Formica, high conductivity copper, very efficient. Made in 25 and 50 turn sizes, priced at \$10.00 and \$13.50 respectively. Also sold in parts ready to assemble.

We distribute the only complete line of panel type meters in America—Thermo-ammeters, AC and DC Voltmeters, Ammeters and Milliammeters. You can now equip your set with a complete set of meters all alike.

Big line of high voltage generators and motor-generators reasonably priced—just what you have been looking for.

### **SPECIAL NOTICE**

Grid coils for the above CW Inductance are now supplied so that the circuit described in July QST can be employed—and take it from us it is the **REAL** amateur circuit. Grid coil for the CW 100 Inductance priced at \$2.00. Ask for our new bulletin containing full dope on this circuit—try it on your own set, it's a winner.

## **October Antenna Specials**

Now is the time to remodel your antenna and we are especially prepared to supply your needs in solid copper, stranded copper and copper-weld aerial wire.

### **Ask about the New Air Gap Type**

Antenna Insulators—wonderful for CW—priced right—positively superior to present forms and materials.

Send for special Antenna Material Bulletin or send 15c in stamps for catalog and complete literature.

**8ZV WIRELESS MANUFACTURING CO. 8ZV**

**CANTON, OHIO**

WIMCO apparatus is distributed in Canada by Ontario Radio Laboratory,  
 Sault Ste. Marie, Ont.

# Standard



**Unwired**  
**\$47**

## Fully Assembled Wired and Unwired Instruments

This efficient receiver is another of the many new high grade instruments offered unwired and wired at a very moderate cost.

It provides for reception of spark, arc and telephone, damped and undamped wave telegraphy, on any wave length between 150 and 700 meters.

This tuner, or any STANDARD multiple wave tuner, detector, or amplifier sent on approval to any part of the United States on receipt of a deposit of one-third the list price. You can examine the instrument and if you do not think it a great bargain return it and we will refund your deposit, after deducting carrying charges.

*Send stamp for descriptive literature.*

## Standard Assembling Company

19 BRIDGE ST.,

Dept. Q-1.

NEW YORK



## Dependable Radio Apparatus BAKELITE VARIOMETER

Correct design

Finest insulation

Low distributed capacity

**PRICE COMPLETE AS SHOWN \$7.50**

If not carried by your dealer order direct sending us his name and address.

*Catalogue on request.*

**DORON BROTHERS ELECTRICAL COMPANY**  
**HAMILTON, OHIO**



**EASTERN  
RADIO**

**INSTITUTE**

**899 BOYLSTON ST.  
BOSTON, MASS.**

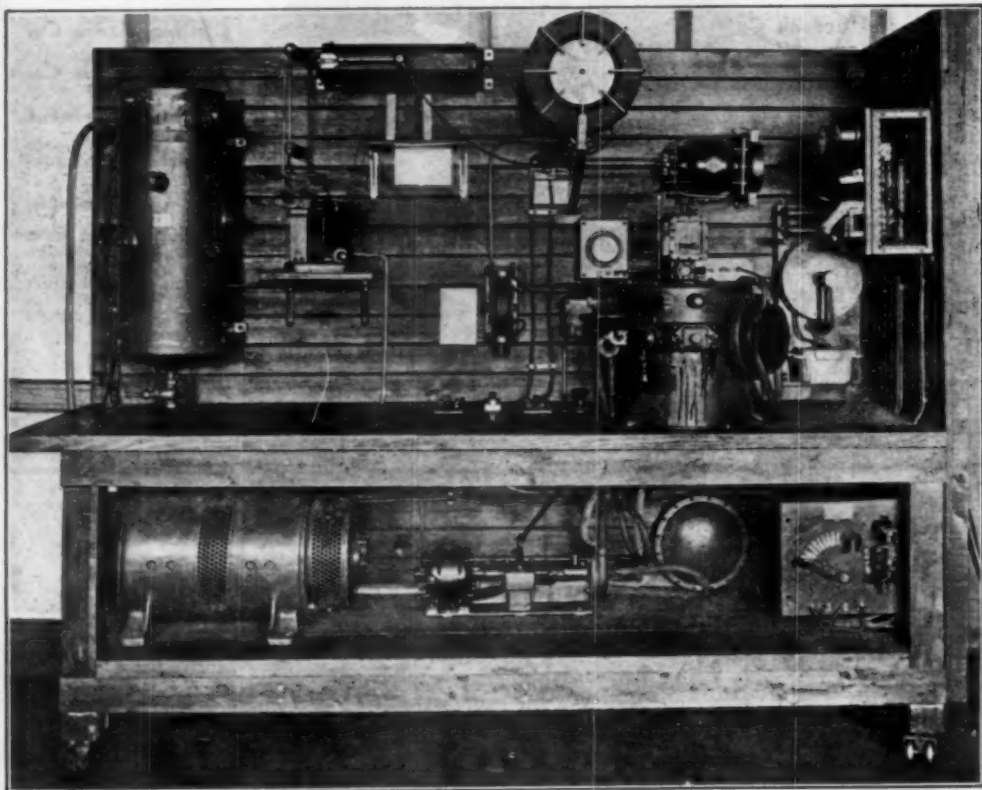
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BACK BAY  
5964**



## SPARK---A R C---VACUUM TUBE

The Revised Examination for Commercial Operators including ARC and VACUUM TUBES is carefully and fully covered by the Course of Instruction offered by the EASTERN RADIO INSTITUTE.

Intelligent students INSIST on being taught upon ACTUAL apparatus!



### "The EASTERN RADIO INSTITUTE'S 2 K.W. 'ARC' "

The EASTERN RADIO INSTITUTE is the OLDEST, LARGEST and BEST EQUIPPED Radio school in New England. The Pioneer school that has always led the way! Ask any man in Radio—he will tell you!

New Students can begin to advantage in the Day or Evening school on any Monday. REMEMBER:—Our ORGANIZATION with YEARS OF PHENOMENAL EXPERIENCE and SUCCESS is behind every man who enrolls! Ask any man in Radio—he will tell you! OVER 4000 satisfied graduates TELL OUR STORY BEST! Why not be one? Our illustrated prospectus is free. If you cannot visit the Institute send for one.

**F. D. PITTS, Director**

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

HI! O.M. HAVE YOU TRIED OUR SERVICE?

WE ARE DISTRIBUTORS OF

## Radio Corporation Products

UV204—250 watt power tubes .....	\$110.00
UV203—50 watt power tubes .....	80.00
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UV201—Amplifier tubes .....	6.50
UV200—Detector tubes .....	5.00
UV217—Kenotron Rectifier tubes .....	26.50
UV216—Kenotron Rectifier tubes .....	7.50
UR542—Porcelain Sockets .....	1.00
UR541—Porcelain Sockets .....	2.50
UM590—Ammeters .....	6.00
UM583—Ammeters .....	6.25
UL1008—Oscillation Transformer .....	11.00
UP1719—Grid Leak—5000 Ohms .....	1.65
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UP1368—Power Transformers .....	\$25.00
UP1016—Power Transformers .....	33.50
UP1626—Filter Reactor .....	11.50
UC1631—Filter Condensers .....	1.35
UP415—Plate Reactor .....	5.75
UP414—Microphone Transformer .....	7.25
PR535—Filament Rheostats .....	3.00
PT537—Filament Rheostats .....	10.00
Tungar Rectifiers—2 amp. ....	18.00
UP1346—Magnetic Modulators .....	9.50
UC1014—Mica Condensers .....	2.00
PR536—"A" Potentiometer .....	2.00
UC570 Grid Condensers .....	1.20

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WE ALSO HAVE FOR DELIVERY, ANYTHING IN THE FOLLOWING LINES:

Wm. J. Murdock Co.	Chelsea Radio Co.
Clapp-Eastham Co.	AMERICAN RADIO & RESEARCH CO.
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	JOHN FIRTH & CO.
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Our laboratory and workshops are adequately equipped to satisfy your most exacting needs in the construction or assembly of special receivers, spark and CW transmitters, or radio telephone sets. Specifications will be furnished without charge.

Dealers write us for our discounts to the trade on Radio Corporation and other products.

K25 VERNIER ATTACHMENTS FOR YOUR CONDENSER, regardless of the make. They fit any dial, and allow for a 10 to 1 adjustment in receiving CW and phone signals. See the August QST for description or send for circular. PRICE .....

48c.

K73 RECEIVER is a complete receiving unit, including bulb and "B" battery. Small enough for any available space, and works better than the biggest. The cheapest and best receiver on the market. See Sept. QST for description. PRICE .....

\$30.00

## KARLOWA RADIO COMPANY

OFFICE—611 BEST BLDG.

ROCK ISLAND, ILL.

## Quality Radio Equipment

### Doubleday-Hill "Federal" Headsets



Very efficient—light weight—highly sensitive. Will meet the most rigid requirements. Both receivers paired by test. Ability to bring in weak signals clearly, make them very popular with experimenters.

2200 ohm D-H. E. Co. "Federal" Headset.....\$8.00

3200 ohm D-H. E. Co. "Federal" Headset.....10.50

Each complete with 6 ft. moisture-proof cord.

Distributors for Grebe, DeForest, Murdock, Signal, Chelsea, Magnavox and other highest grade Radio Apparatus. All sizes of Radiotron Vacuum Tubes always in stock.

Mail orders promptly filled. Dealers,—Write for discount.

## DOUBLEDAY-HILL ELECTRIC CO.

715 12th St., N. W., Washington D. C., Radio Dept.—Desk A 719-21 Liberty Ave., Pittsburgh, Pa.





# AIDS TO BETTER RADIO

## DUBILIER C W CONDENSER

Type No. 580

Made in Single Capacities

0.001  
0.002  
0.005  
0.01  
0.02

Price - \$4.00



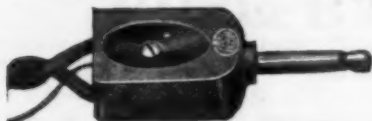
Cat. #310 Triple Capacity

0.0003  
0.0004  
0.0005  
5,000 volts  
4 amperes

Price - \$4.50

This latest addition to the already remarkably complete line of the Dubilier Condenser Company will meet a long-felt want of all amateurs interested in CW Transmission. The #580 condenser is extremely compact, is of rugged construction and the losses are infinitesimal.

### The Pacent Universal Plug



Cat. #50, Price \$2.00

No connections to solder. Essential for modern radio transmission and reception. Approved by the Navy Department. Endorsed by foremost amateurs. Supreme in its field. Standard with many radio companies.

### The Dubilier Universal Condenser



Type #577, Price \$2.00

For transmission and reception. Supplied in most used capacities from .01 to 0.0005 mfd. Especially designed for C.W. Will carry one ampere at 1,000 volts. Standard with many radio companies.

**DEALERS AND JOBBERS**—You will be interested in our new proposition.  
**AMATEURS**—Send five cents in stamps for Catalog Q1 describing "Pacents Radio Essentials".

## Pacents Electric Company, Inc.

Louis Gerard Pacent, President

SOLE DISTRIBUTORS OF

Wicony's Complete Line of "Eventual" Apparatus.

Duo-Lateral Coils,  
Standard VT Batteries,

Pacents Plugs,

Dubilier Condensers,

Special Distributors of Brandes Phones

Special Distributors of Westinghouse Equipment.

Seibt Condensers

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**WESTERN RADIO ELECTRIC COMPANY**  
550 South Flower  
LOS ANGELES, CALIF.

274 Twelfth St.  
OAKLAND, CALIF.

# RADIO APPARATUS

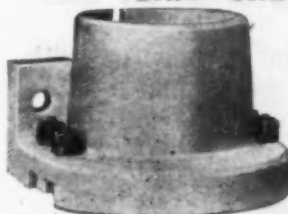
# CROSLEY

## RADIO APPARATUS

**"Better---Costs Less"**

### A Smashing Hit CROSLEY V-T SOCKET—60c

**"Better—Costs Less"**



Here are the reasons why this socket won instant popularity—why it was the hit of the Chicago Radio Show—why today it is the biggest seller.

It's the only socket made for both base and panel mounting. It's made in

one piece, entirely of porcelain—there is no metal shell—hence no "ground hum." Its design eliminates possibility of short circuiting filament across high voltage "B" Battery. It is better—and costs only 60 cents.

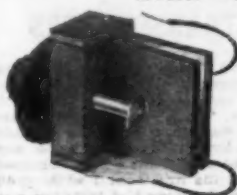
Be sure to use CROSLEY SOCKETS in the radio set you are building. Every live dealer handles them—if yours doesn't, send us his name and order direct—we will ship prepaid.

Announcing

### The Crosley Variable Condenser

Pat. Pend.

**"Better—Costs Less"**



This Condenser works on an entirely new principle. The two plates are hinged and are opened and closed like a book by means of a specially designed cam. The plates are surfaced with copper. One copper sheet is covered with mica so that when the

two plates are clamped tightly together the maximum capacity is obtained. The maximum capacity of this Condenser will average about .0008. We rate it conservatively, however, at .0005.

This Condenser has several advantages over the ordinary type of air condenser. Will stand 1000 volts without breaking down. It can therefore be used for CW work. Has no body or hand capacity effect. Has much greater signal strength due to the fact that mica is a much more efficient dielectric than air. The calibration curve of this Condenser is almost a straight line. Has unusually low zero capacity—.00006.

Price without knob and dial.....\$1.25  
With knob and dial.....1.75  
Mounted in cabinet with knob and dial.....2.50

Sold on a GUARANTEE of absolute satisfaction or money refunded.

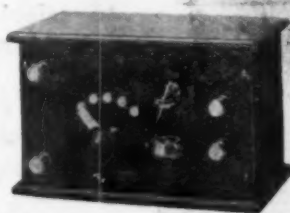
DEALERS: It will pay  
you to handle our line.  
Write for particulars.

**CROSLEY MFG. CO.**

Radio Dept. Q-5

Cincinnati, O.

### HARKO RADIO RECEIVER



No batteries,  
tubes, etc., re-  
quired.

Hook it to your  
aerial and phones.  
It will tune  
from two hun-  
dred to six hun-  
dred meters,  
bringing in spark,  
voice and music,  
with an average  
amateur aerial.

Complete with  
battery and inter-  
rupter for crystal testing, crystal, etc. Price \$7.00.

Phones extra.

DEALERS: This will help you get 'em started

## Crosley Cabinets



The tendency in the radio field today is to put apparatus in cabinets not only for appearance's sake, but as a protection from dust, dirt, atmospheric conditions, etc. Realizing the demand for attractive stock cabinets of various sizes, we are building them in quantities in our large wood working plant. These cabinets are all uniform in style. The panels are rabbeted in to the front. As the outside dimensions and inside dimensions are either larger or smaller than the panel itself, we show panel size and also inside dimensions. Prices quoted do not include the panels.

All cabinets are waxed antique mahogany finish. Wood used is either gum, genuine solid mahogany or quartered oak. Lids or tops are hinged. Sizes and prices are shown below:

For Panel Size	CABINETS Inside Dimensions			Mahogany or Quartered	
	High	Wide	Deep	Gum	Oak
6x7	5 1/2"	6 1/2"	7"	\$2.50	\$3.85
6x10 1/2	5 1/2"	10"	7"	2.75	4.40
6x14	5 1/2"	13 1/2"	7"	3.30	5.55
6x21	5 1/2"	20 1/2"	7"	3.90	7.30
9x14	8 1/2"	13 1/2"	10"	3.70	6.80
12x14	11 1/2"	13 1/2"	10"	4.40	6.80
12x21	11 1/2"	20 1/2"	10"	5.25	10.60

Cash must accompany order. No C.O.D.'s. We pay transportation charges.

We can furnish genuine formica panels 1/4" thick, cut to the following dimensions: 6x7; 6x10 1/2; 7x9; 6x14; 7x12; 6x21; 7x18; 9x14; 12x14; 14x18; 18x21. Price of panels—2 1/2 c. per square inch. For odd sizes order the next largest size; we will trim. We pay postage.

Every article bearing the name "CROSLEY" is GUARANTEED to give absolute satisfaction or money will be refunded.

We shall be pleased to send literature describing the above mentioned and other radio apparatus to any one free of charge upon request. Get your name on our mailing list to receive latest Bulletins of other new Crosley products. If your dealer does not handle our goods, order direct and send us his name.

## Using An Inefficient Condenser Is Like Carrying Water In A Sieve



The same judgment used in the purchase of radio equipment that you use unconsciously in everyday affairs will invariably lead you to select COTOCO condensers. Users are unanimous in proclaiming them "the best."

This condenser used in conjunction with our inductance units will enable you to build a set that you will be proud to own.

*If your dealer cannot supply you with our products, advise us, and send us his name*

**COTO-COIL CO.** 87 Willard Ave.,  
Providence, R. I.



TYPE R3

**MOUNTED \$4.50**

## THE LATEST A-A 10 to 1 RATIO AUDIO FREQUENCY AMPLIFYING TRANSFORMERS

With the introduction of the new UV-201 and C-301 Cunningham amplifying tubes we found it necessary to design an Audio Frequency Amplifying Transformer that would meet amplification and internal resistance constants which are quite different from those of the previous tubes. "A-A" amplifying transformers are scientifically designed for commercial manufacture and are made strictly on a quality basis. They are most efficient because the turn ratio and resistance of the windings are such that maximum amplification is obtained without distortion in the telephonic currents. The coils are wound with #40 enameled wire with treated paper insulation between the layers of winding and the convolutions of wire are spaced to cut the turn to turn capacity down to the minimum. This is a big factor in eliminating distortion—commonly known as howling. All of our transformers are impregnated in a special wax compound by the vacuum process.

**UNMOUNTED \$3.50**

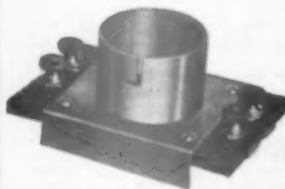
**SEMI-MTD. \$4.00**

Our first transformer having a ratio of 3 to 1 has proved to be most efficient on Marconi VT's, Moorhead, Western Electric and similar tubes and will also be found desirable on the 3rd or 4th step using the UV201 tubes with our new transformer on the 1st and 2nd stage. It is known as AA Type R2.

**MOUNTED \$4.25**

**UNMOUNTED \$3.35**

**SEMI-MTD. \$3.80**



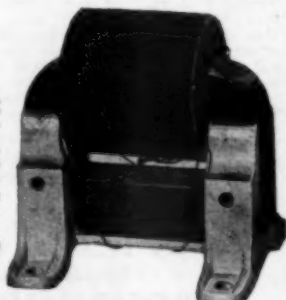
### The "A-A" Power Tube Socket

This socket is designed for use with the UV 203 and the C 303 50 watt power tube. A well made, nice appearing socket, with insulation designed to withstand 3000 volts. Socket and base shell are of brass with Bakelite strips containing binding post terminals. Shipping weight, 2 pounds.

No. R-4 Power Tube Socket, price.....\$3.00

**ALL-AMERICAN  
ELECTRICAL MFRS.**

1516 N. Lorel Ave., Chicago, Ill.



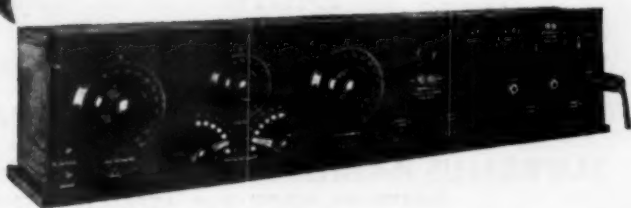
TYPE R3 SEMI-MOUNTED





A man without thought for the  
future — must soon have present sorrow.  
Think of the coming clear cold nights  
and buy that **Grebe Receiver**  
Now!

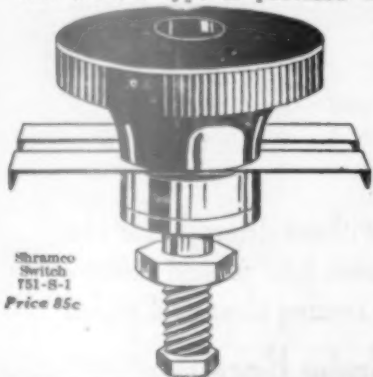
*Doctor Tuffy*



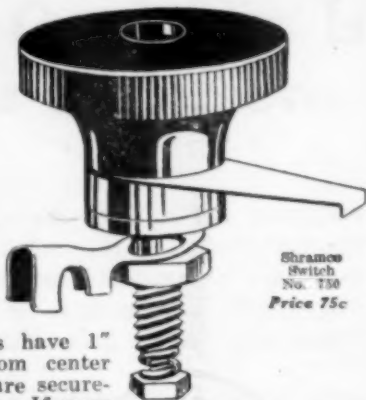
## Shramco Switches

**Y**OU CAN hardly afford to take chances of losing efficiency by getting along with poor switches. Either of these two styles will distinguish itself by smooth operation and sure contacts, in addition to the handsome appearance. Both have polished nickel finish and are furnished with large Marconi type knob. Bearing block and panel bushing  $\frac{3}{4}$ " in diameter. For use on all panels up to  $\frac{1}{2}$ " thick. Blades, spring phosphor bronze. No. 750 type has spring tension adjustment; switch radius,  $1\frac{1}{2}$ ".

No. 751-S-1 type is provided with split lock



Shramco  
Switch  
751-S-1  
Price 85c



Shramco  
Switch  
No. 750  
Price 75c

nut; blades have 1" radius,  $\frac{1}{2}$ " from center to center, and are securely held in place. If your dealer cannot supply you, send your order direct, postage extra. Dealers who have not a supply of Shramco switches should write for proposition at once.

*For all your VT's use the famous Shramco Reos. Panel type rheostat, with Ni-chrome resistance, specially designed for each type of tube. At your dealer, or write.*

### SHOTTON RADIO MFG. CO., Inc.

P. O. Box 3,

Scranton, Pa.

Catalogue "K", listing a complete line of high grade parts at reasonable prices, sent to any reader of QST for five cents in stamps.

## "Z-NITH" RADIO EQUIPMENT

"KNOWN THE WORLD OVER"

THE LATEST IMPROVED "Z-NITH" RADIO MODELS NOW READY—SUPERIOR IN DESIGN, WORKMANSHIP AND PERFORMANCE

### "Z-NITH" REGENERATOR

"THE PRIDE OF ALL"

THE REGENERATOR THAT HAS MADE RECORDS IN ACTUAL RELAY TEST REPRESENTING

CHICAGO RADIO LABORATORY

FOR THE EAST

SUPREMUS RADIO LABORATORY, WEST NORWOOD, N. J.

AMATEURS WRITE FOR ATTRACTIVE CHRISTMAS OFFER



## BURGESS "B" BATTERIES

(Individual cells completely insulated)

The Standard of Quality

Ask the operator who uses them

5156 (with taps) Send for Bulletin No. 18 for prices and complete descriptions

BURGESS BATTERY COMPANY

HARRIS TRUST BLDG.,

CHICAGO

SAY OLE MAN—DO YOU REALIZE THAT THE 'QRN' SEASON IS ALMOST OVER, AND BEFORE LONG THE NEW C.W. STATIONS WILL BE MAKING LONG DISTANCE RECORDS—WELL



IF YOU COMPREHEND ALL THIS—ARE YOU EQUIPPED WITH A RECENER THAT WILL EN-ABLE YOU TO PARTICIPATE IN THE COMING-RECORD BUSTING—? NO—WELL THEN—GET YOURSELF A—



**CHICAGO RADIO LABORATORY—'Z-NITH'**  
REGENERATOR—IT'S A TUNER THAT WILL TUNE ANY C.W. ON SPARK ON 200 TO 2000 METERS FROM THE ALPS TO OMAHA—PROVIDED YOUR FINGERS



AND TO CINCH THE ARGUMENT THE C.R.L. IS GIVING EVERY PERSON ON THEIR MAILING LIST A COUPON WORTH \$ DOLLARS ON THE PURCHASE OF A REGENERATOR—THAT GIVES YOU ALL



**QRX FELLOWS—HERE'S YOUR CHANCE TO SAVE FIVE DOLLARS ON A REAL C.W. RECEIVER**

**BEST  
FOR  
SPARK**



**BEST  
FOR  
C.W.**

**Z-NITH REGENERATOR**

To be useful in a modern radio station, a receiver must be equally satisfactory for the reception of spark and C.W. signals. A set designed to respond to either alone does not meet the needs of an up-to-date DX traffic station.

The new improved Z-NITH Regenerator, with a range of 180-1000 meters, 180° coupling, vario-meters with balanced inductance and many other exclusive features will enable you to handle traffic with spark, C.W. and radiofane stations at will.

In order to boom fall business, we are sending, without charge, a coupon, good for \$5.00 on the purchase of one of these wonderful new Regenerators to every person on our mailing list. If we don't have your name, and you want to take advantage of this unprecedented offer—

**WRITE US NOW!**

**Chicago Radio Laboratory**

**6433 RAVENSWOOD AVENUE,**

**CHICAGO, ILL.**

# THE BENWOOD "ULTRA" GAP



## A complete "Knock-out"

Cast iron or aluminum housing. New Departure Ball bearings. Glass insulation.

## AND THE DISC!!

Aluminum disc, no heavier than the old style BENWOOD rotor.

10 inches in diameter, one and one-quarter inches in thickness, BAKELITE CENTER, 8 POINTS, designed SPECIALLY for SYNCHRONOUS gaps.

**DISC SOLD SEPARATELY at \$9.50**

WRITE FOR NEW BENWOOD BULLETIN—LISTS EVERYTHING.

**THE BENWOOD COMPANY, Inc.**

1300 Olive Street,

St. Louis, Mo.

**< STANRAD >**

**6EN Works 1000 Miles**

On ten watts CW

**YOU CAN TOO!**

*with apparatus designed for*

**Results—Efficiency—Service**



The 'Stanrad' inductance is built for RESULTS—that's what you want—RESULTS!

It has 54 turns of copper wire wound on a 4 inch threaded Formica tube. The wire can not slip or come loose.

An unthreaded margin is left at each end making it easy to mount by means of brackets, mounting posts, etc.

Single or two coil winding.....\$5.00

Threaded Formica tube only ..... 3.75

Inductances for 100 watts .....10.00

*If your dealer cannot supply you, write direct.*

**STANDARD RADIO CO.**

**LOS ANGELES, CAL.**

## Quality - Service

We have the parts for that new set U R building, from the leading Radio Concerns in America.

**and**

Shipment is made the same HOUR order is received!!

We are equipped to make your apparatus to order, and Specialize on C.W. parts and equipment.

**ALL APPARATUS GUARANTEED**

**Questions answered free!!**

Enclose postage. This is just one feature of our SERVICE!

LOOK US UP WHEN IN COLUMBUS. WE'LL GIVE YOU A ROYAL WELCOME

**COLUMBUS RADIO  
APPARATUS CO. (8ARV)**

694 CARPENTER ST., COLS., OHIO.



# MEYBERG

The Largest Radio Stock on the Pacific Coast

SAN FRANCISCO

Everything the  
Amateur Wants



LOS ANGELES

Send for 32-page Remler  
Catalogue—just off press

Stocks Guaranteed—Prompt Service From Either Address

## VACUUM TUBES

C300 Cunningham Detector.....	\$ 5.00
C301 Cunningham Amplifier.....	6.50
C302 Cunningham 5 Watt Power.....	8.00
C303 Cunningham 50 Watt Power.....	30.00
UV200 Radiotron Detector.....	5.00
UC201 Radiotron Amplifier.....	6.50
UV202 Radiotron 5 Watt Power.....	8.00
UC203 Radiotron 50 Watt Power.....	30.00
Moorhead Electron Relay.....	5.00
Moorhead VT Amplifier.....	6.50
Moorhead VT Transmitter.....	7.50
Moorhead Rectifier Tube.....	9.75

All tubes postage postpaid.

## AMPLIFYING TRANSFORMERS

231A General Radio.....	\$ 5.00
226W Federal.....	7.00
A2 Acme-Unmounted.....	4.50
A2 Acme Semi-mounted.....	5.00
A2 Acme Fully mounted.....	7.00
UV712 Radiotron.....	7.00

## EVEREADY BATTERIES

765 Small 22½ Volt B.....	\$ 2.50
766 Large 22½ Volt B.....	3.50
774 Variable 43 Volt B.....	5.00
746 Special 108 Volt Amp. B.....	16.50
6 Volt 40 Amp. hr. Storage.....	18.20
6 Volt 60 Amp. hr. Storage.....	20.80
6 Volt 80 Amp. hr. Storage.....	24.05

## REMLER APPARATUS

Moulded Bakelite Variometers.....	\$ 6.00
503 Moulded Bakelite Variocouplers.....	5.40
100 3" Bakelite Dial and Knob.....	1.00
330 Detector Panel Moulded Bakelite.....	8.00
331 Amplifier Panel less Transformer.....	6.00
333 Amplifier Panel less Transformer.....	9.00
(with cam switch)	
810 Jr. Reostat.....	1.00
94 A Battery Potentiometer Unit.....	.75
74 Knob and Lever for above.....	.45
96 Variable Grid Leak.....	.60
97 Fixed Grid Condenser.....	.35
400 3 Coil Mounting on base.....	6.50
3 Coil Mountings for Panel Mtg.....	3.60

## TELEPHONES

Brandes Superior.....	\$ 8.00
Brandes Trans-Atlantic.....	12.00
Brandes Navy.....	14.00
Baldwin Type C Navy.....	16.50
Baldwin Type E.....	20.00
Baldwin Type F.....	21.00
Murdock No. 55 2000 ohm.....	4.50
Murdock No. 55 3000 ohm.....	5.50

## JACKS AND PLUGS

Federal 1421 open Circuit Jack.....	\$ .70
Federal 1422 single Circuit Jack.....	.85
Federal 1423 double Circuit Jack.....	1.00
Federal 1435 Automatic Filament Control Jack.....	1.20

Federal 1438 Automatic Filament Control Jack.....	1.55
Western Electric Plugs.....	1.30
Federal Plugs.....	2.00
Pacent Universal.....	2.00

## SOCKETS

No. 92 Remler Socket.....	\$ 1.50
No. 156 General Radio.....	1.50
No. 550 Murdock.....	1.00
No. R300 DeForest.....	1.60
De Forest Moulded Bakelite.....	1.40

## VARIABLE CONDENSERS

No. 230 Wireless Shop Panel Mtg. .0005.....	\$ 3.60
No. 430 Wireless Shop Panel Mtg. .001.....	5.25
No. 630 Wireless Shop Panel Mtg. .0015.....	7.50
No. 1 Chelsea Mtd. .0011.....	5.00
No. 2 Chelsea Mtd. .0008.....	4.50
No. 3 Chelsea Unmtd. .0011.....	4.50
No. 4 Chelsea Unmtd. .0008.....	4.00

## REGENERATIVE RECEIVERS

Myco D12 175 to 25000 meters Detector	
2-step Amp. less Coils and Tubes.....	\$165.00
CR3 Grebe Relay Special.....	68.00
CR3A Grebe Tube Control self-contained.....	47.50
CR5 Grebe 175-3000 meters tube control.....	85.00
CR6 Grebe 175-680 meters Det. 2-step.....	210.00
CR7 Grebe 5000-20000 Long wave	
Special.....	220.00

## C. W. APPARATUS

### JEWELL METERS

O-100 Milliamps Flush Mtg.....	\$ 8.00
O-250 Milliamps Flush Mtg.....	8.00
O-500 Milliamps Flush Mtg.....	8.00
O-15 Volts Panel Mtg. back-con.....	10.00
O-500 Volt Meter.....	16.00
O-1000 Volt Meter.....	23.00
O-1500 Volt Meter.....	29.00
O-1, O-2, O-2½, O-5, Thermo coupled	
Radiation Meter Flush Mtd.....	12.00

## MOTOR GENERATORS

Westinghouse 100 Watt 110 Volt 60 cycle	
AC 500 Volt DC.....	\$ 80.00
Westinghouse 250 Watt 110 Volt 60 cycle	
AC 1000 Volt DC with 87 Volt	
Grid Bias Tap.....	142.50
Pacent Universal CW Condensers, any capacity.....	2.00
CW Tuning Inductance.....	8.00
Variable Grid Leak 8000 ohm.....	3.00
Wireless Shop Condenser .0008.....	9.00
231M Modulation Transformer.....	5.00
Kellogg Transmitter.....	3.50
Kellogg Transmitter, adjustable arm.....	4.75
IMF-21AA Western Electric Filter Condenser.....	2.75
Double Filter Choke.....	6.60

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Our Stock Guarantees Service. Send For Special Co-operative Plan.

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## C.W. TRANSMISSION GIVEN A BOOST BY OUR TUNER THE SENSATION OF THE CHICAGO RADIO SHOW

Many of us were holding off installing C.W. sets because it seemed it was not going thru. Variometer Reception and capacity effects were a draw back. Our new Tuner solves all problems and C.W. sigs sure fill the air.



### C.W. TUNER—TRESKO MODEL

Complete with 2 Cond. \$30.00 wt. 6lb  
Tuner without 2 Cond. \$15.00 wt. 4lb  
Tuner for panel mtg. \$10.00 wt. 2lb  
Since making this cut we have added  
Knobs to our Tickler Coils.

For description of Tuner and Hook-up  
see QST June, 1921, read first article.

**THIS TUNER WILL BE IN 5 ENGLISH AMATEUR STATIONS** when our American amateur goes there to receive our spark and C.W. sigs. Watch the results.

### ANNOUNCEMENT EXTRAORDINARY

We will ship prepaid one of the \$15.00 type of tuners to any relay-man member of A.R.R.L. with 2 years experience, on receipt of letter from your Dist. Supt. stating you have had this experience. 10 day free trial allowed.

Spark and C.W. come in equally well. Absolutely no capacity effects. Coil oscillates on one turn only of primary. Ticklers set once for each aerial then seldom touched. Orders ship in rotation. Our 24 page catalog sent you for 10 cents.

**TRESKO,                      DAVENPORT,                      IOWA**



## The RHAMSTINE\* VT Battery

**\$3.00    Panel Equipped — Variable**

Add 30c. for Postage  
and Packing. West of  
Rocky Mountains 50c

This latest addition to the RHAMSTINE\* Quality Line must be seen to be appreciated. Complete with plated switch and special binding posts on bakelized panel. Variable from 1½ to 22½ volts. Designed for use beside the set. Large cells, made of the best materials obtainable assure long life. Overall size 2¼x4½x7¼. Quietness, convenience and excellent appearance characterize this high grade product.



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### ANNOUNCEMENT!

We wish to announce that the LIBERTY RADIO SUPPLY CO., located at 6808 ABERDEEN ST., have reorganized and changed name to the APEX RADIO SHOP and are now located, at 1105 W. 69th. St., Chicago, Ill. We are now carrying a complete line of Standard Radio and C.W. Supplies and are in a position to serve all local and mail order customers more promptly. Our MOTTO is SERVICE, PRICE and SATISFACTION. Local Amateurs are invited to visit our new store. Send your name and address for future catalog and bulletins.

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# Not one but all

Not one but all of the properties essential to radio insulation are found in Condensite.

In radio work more than in any other class of electrical equipment, mechanical, electrical, thermal and physical properties of a high order are requisite. For example tensile strength transverse, compressive, hardness, good machining qualities, polishing qualities, resistivity, dielectric loss angle, dielectric strength, high frequency flash over, specific inductive capacity, high temperature resistance, low temperature resistance, thermal resistivity, moisture resistance and resistance to chemical action. All these desirable properties are to be found in Condensite, and in no other substance are there so many of them combined, nor in such high degree.

Condensite is used in two principal forms for radio work, in one it is molded under pressure in steel molds and in this form can be had in the desired articles in nearly every brand of radio apparatus made in this country.

In the other form it is made in sheets, rods and tubes, used largely for panel work and is called Condensite Celeron, made by the Diamond State Fibre Co. of Bridgeport, Montgomery Co., Penna.

If you are interested in radio work, let us send you pamphlets descriptive of Condensite and when you are buying apparatus, specify that it shall be made of Condensite.

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**PARAGON RADIO TELEPHONE TYPE 2-5-U**  
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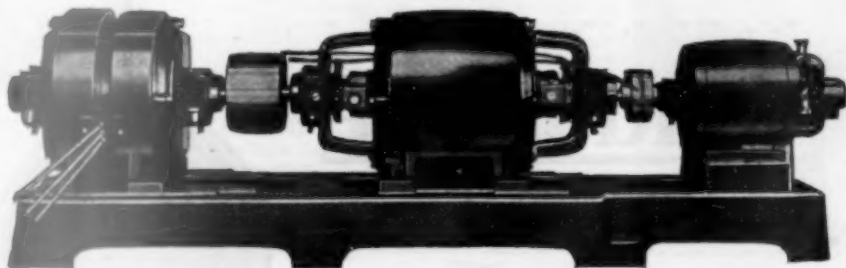
*CW and Buzzer:* (1 5 watt tube)  
Cedar Grove, N. J. to Savannah, Ga., Norfolk, Baltimore, Philadelphia, Indianapolis, Ft. Wayne, Peoria, Cleveland, Buffalo, Toronto, Boston, Etc.

Highly Efficient; remarkably flexible; voice, buzzer, or CW; instantaneous access to 7 wave lengths; a perfect "short haul" universal transmitter that's delightfully effective.

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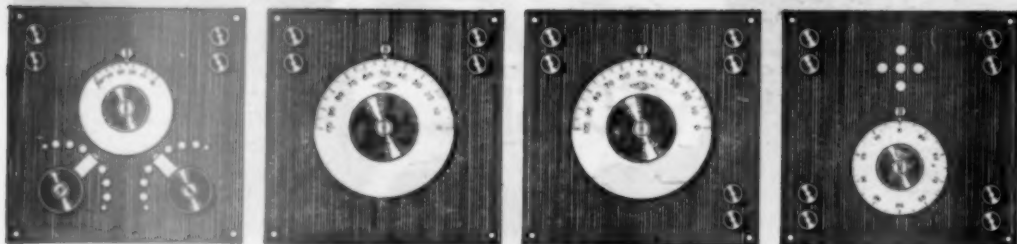
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8XS



## For Your Receiving Set,

We recommend these four standardized unit panels. When coupled together they form a high grade, efficient short wave receiver complete with audion control for only **THIRTY-ONE DOLLARS**.

On the left is shown the variocoupler, with fine and coarse primary tuning switches and variable secondary coupling. Next is the grid variometer which controls the wave length from 175 to 450 meters, a range which may be increased if desired by a small fixed condenser. The third instrument is the plate variometer and last is the audion panel with grid condenser, leak, socket, rheostat, etc. The variocoupler and variometers are priced at \$4.00 each and the audion control at \$7.00, all postpaid.

These are four instruments from the new series of unit panels which we manufacture. Each instrument is mounted on a panel of grained bakelite-dilecto 5" x 5" and the very best in materials, workmanship and design is used throughout. Other units, including condensers, amplifiers, etc., are described in our catalog which will be mailed for 5c.

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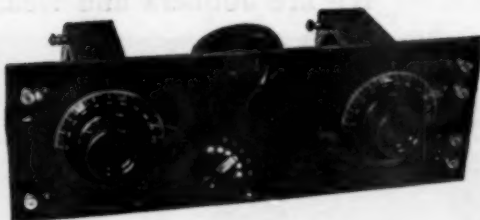
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2 Pair Variometer Brackets	0.70
1 Switch	.35
6 Switch Points	.35
6 Binding Posts	.72
10 Feet Connecting Wire	.08

Total .....\$30.50

2 Tuska Variometers	.....\$12.50
2 Tuska Dials	.....3.30
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TYPE 223

**The C. D. Tuska Company,**  
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When a Man starts to run in a race, he tries his level best to win, and if he tries hard enough he will. That's why Kelly & Phillips' Quality Service and Price counts so much with the amateurs.

The New Grebe C.R.8	.....\$80.00
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and your station will never be closed because of a discharged battery.



Is it not gratifying to feel that your filament battery will always be ready when you want it and that you will never have to give up in disgust when working a distant station.

F-F Battery Boosters are automatic and operate unattended. Screw plug in lamp socket, snap clips on battery terminals and see the gravity come up.

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Order from your Dealer or send check for Prompt Express Shipment. If via Parcel Post have remittance include Postage and insurance Charges. Or have us ship C.O.D. Other F-F Battery Boosters charge batteries from Farm Lighting Plants, Direct Current Circuits and D.C. Generators. For Group Charging use our Full Wave Automatic F-F Rotary Rectifier of 100 Volt, 36 cell capacity. Order Now or Write for Free BOOSTER Bulletin No. 31 to HUIAN 31A  
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MURDOCK No. 56

DOUBLE SET

2000 OHM

3000 OHM

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RELIABLE SERVICE—UNEQUALED VALUES

GUARANTEED TO SATISFY

## MADE BY MURDOCK VARIABLE CONDENSERS PANEL TYPE

43 PLATE

23 PLATE

.001 Mfd.

.0005 Mfd.

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*Bulletin of other Murdock Radio Apparatus on request.*

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When you decide to study wireless keep the fact in mind that the Mass. Radio and Telegraph School Inc., has graduated more First Class and First Grade Commercial operators during the last 10 months than any other Radio School in New England.

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We specialize in C.W. installation and carry a complete line of supplies and apparatus. Being a school, we know the latest in C.W. We have a staff of experienced technical men to solve your C.W. problems.

You will find at our store the same high grade service that has earned for us the reputation among Radio men of being New England's leading Radio School. Open Monday, Wednesday and Friday evenings until 9:30 P.M.

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**18**

**MASSACHUSETTS RADIO & TELEGRAPH SCHOOL, Inc.**

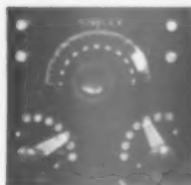
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Vario-Coupler  
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Variometer  
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Audion Panel  
\$11.00

Unmounted  
Variometers  
and  
Vario-Couplers  
\$6.00 Each

Amplifier Panel  
\$20.00

These four panels form a short wave receiver of unusually high efficiency and appearance, fully described in bulletin #11. Write for it. If your dealer cannot supply you, send your order with his name.

Dealers send for trade discount.

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# 20 MILES PER WATT

100 miles with a single 5-watt tube is becoming common operating practice. Quality, not quantity, is the secret of successful CW work. We seldom hear today a mere statement of miles worked. It is miles per watt.

For many years the General Radio Co. has been supplying the research and technical laboratories of the country with scientific radio apparatus. The citizen radio men today are demanding exactly this same high quality apparatus, and they have found that it is no more expensive than the average amateur radio apparatus on the market.

We recommend that you consider General Radio apparatus the next time you make a purchase. It will save you money in the end. The three instruments illustrated here are selected as representative of our complete line. Ask your dealer to show them to you.



TYPE 127 AMMETER

## Radiation and Filament Ammeter

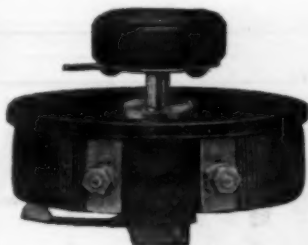
Results with a CW set are not obtained by sending: "CQ—How are my sigs OM?" The circuits from input to output must be adjusted by ammeters.

The hot wire ammeter is the universal meter for this service. It is adapted for D.C., low frequency A.C., or radio frequency. It can be checked at any time on D.C. and will be equally accurate on radio frequency. As its action depends on the fundamental IR law, it always measures actual effective amperes.

Our Type 127-3" Hot Wire Ammeter was made for exactly this service. It is made in front-of-board and in flush models, as illustrated, and in a variety of ranges.

**RUGGED—RELIABLE—ACCURATE**

**PRICE \$7.75**



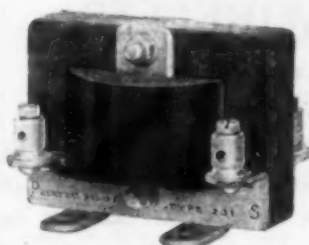
TYPE 214 RHEOSTAT

## Transmitting Tube Rheostat

The 5-watt Radiotron tubes require filament currents of 2.35 amperes. To regulate these tubes on as high as a 12-volt source, a 2-ohm 2.5 amp. rheostat should be used.

Our Type 214 rheostat meets these requirements exactly. It runs cool and may, accordingly, be mounted in enclosed places. It is smooth in its operation. No grating or arcing. Made in two models—for front of panel or for back of panel, as illustrated, mounting.

**PRICE \$2.50**



TYPE 231M TRANSFORMER

## Modulation Transformer

Modulate correctly. Under-modulation means wasted energy; over-modulation, distortion. Our Type 231-M modulation transformer is the result of careful engineering design to produce a transformer which will give the maximum modulation possible without distortion.

Much depends on the modulation transformer. Give your set a chance.

**PRICE—COMPLETELY MOUNTED—\$5**

Remember that the three instruments described above are but illustrations of our complete line. Other instruments are of the same high quality. They include a vacuum tube socket with heavy contacts suitable for transmitting as well as receiving tubes, an amplifying transformer, coils, condensers, switches, etc.

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**GENERAL RADIO COMPANY**

MASSACHUSETTS AVENUE AND WINDSOR STREET

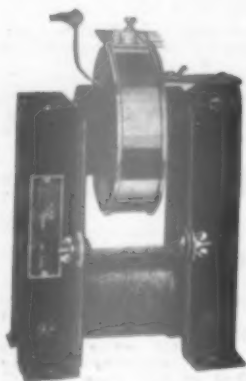
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OF THE



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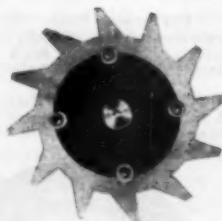
"Gold Medal" Transformer

for \$10.00

(Regularly Listed at \$15.00)

and the

"Baby" Rotor for \$1.85



## Thordarson Electric Mfg. Co.

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Build your own. A 10 watt set to operate from A.C. or D.C. 350 to 750 volts. Full instructions and diagram supplied.

1-Acme Inductance .....	\$8.00
1-Acme Grid Coil .....	2.00
1-Acme Choke Coil .....	8.00
1-Grid Condenser .....	2.00
3-1mf. Fixed Condensers .....	3.75
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1-Filament Rheostat .....	3.00
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Braided Aeroplane Antenna Wire	\$1.00
Per Coil of 200 Feet. Add Postage 1 lb.	

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Now has a good Up-to-Date stock of

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Genuine Bakelite Panels cut to any size, in ½", ⅓" and ¼" thickness at 2c, 3c and 4c per square inch.

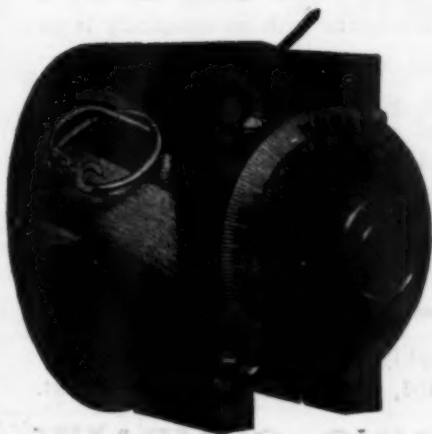
## WOLFE ELECTRIC CO.

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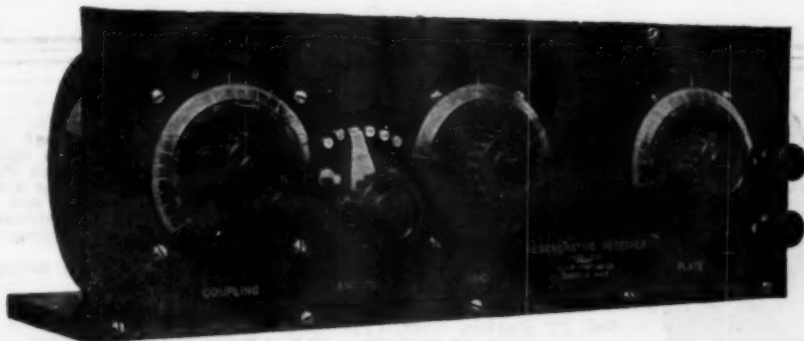
# QUALITY **CE** SERVICE



C.E. Variometer Type Z.R.V. Complete \$6.50  
Without Knob or Dial \$5.75

We don't say that C.E. apparatus is the only good radio equipment you can buy. But we do say that every piece of equipment in the C. E. line is made not just to sell but to SERVE.

For instance, when you buy this Type Z. R. V. Variometer for \$6.50 you know, of course, you are getting a variometer at a low price. But you can be sure—because it is a C.E. product—that this variometer at \$6.50 will give you your full money's worth in satisfactory service. It affords a means of regulating inductance that you can depend on as permanently accurate. And its range of inductance is unusually wide—1.25 millihenry maximum to .1 millihenry minimum. Brush connections enable the rotor to be continuously rotated without breaking connection. Another thing, the outer portion of this C.E. Variometer is of unit construction, a feature that prevents the troubles due to misalignment of bearings which so often happens when the outer element is made in two parts. .Furnished unmounted. Ready for use either on table or panel.



C.E. Regenerative Receiver Type Z.R.V. 175-600 Meters Complete .....\$38.00

Then there is this C.E. Regenerative Receiver Type Z.R.F. 175-600 Meters—consisting of a small coupler or receiving transformer, a variometer connected in the grid circuit and a variometer connected in the plate circuit together with a grid condenser and a grid leak. Remarkable results, in long distance short wave work may be had with this set, requiring only the addition of telephones, tube and tube panel. Here is another case where C.E. facilities enable you to obtain thoroughly high grade wireless equipment, of advanced design and first quality materials and workmanship, at a low price.

Send 6 cents for the C.E. Catalog showing our full line of radio equipment—Hytone Transmitting Sets, Oscillation Transformer, Regenerative Receiving Sets, Radio Telephone Receiving Set, Two Stage Amplifier, Wavemeter, Tesla Coils, Spark Dischargers, Keys, Instruments, etc., etc.

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RADIO ENGINEERS *and* MANUFACTURERS

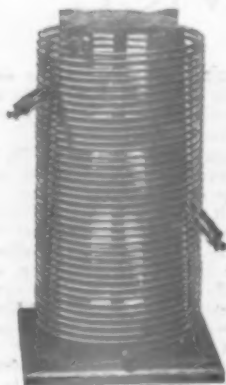
114 MAIN STREET,

CAMBRIDGE, MASS.

California Representative: Leo J. Meyberg Co., San Francisco and Los Angeles.

127-4

## C-W Inductance--Type A 35



This CW Inductance has thirty-five turns of three sixteenth inch hard drawn copper tubing, affording a very low resistance conductor with an unusually large surface.

The turns on this inductance are six inches in diameter and wound on a grooved Bakelite frame, doing away with dielectric losses.

Complete with insulated connection clips.

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Price - - \$12.00

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Description of our complete line of Amplifying Horns, Radio Frequency Choke Coils, etc. in Bulletin No. 101, mailed free upon request.

### COX MANUFACTURING COMPANY

3138 Payne Ave.,

Cleveland, Ohio



### WE USED OUR BEAN

In Designing

THE PARKIN DIAL TYPE RHEOSTAT (Pat. pending) and by mounting the resistance element in a circular groove in the back of a 3" molded Bakelite dial eliminated one part and saved you the cost of a dial. The groove being recessed, allows the dial to clear the panel by the usual distance of  $\frac{1}{8}$ ". An off position is provided and a stop on the dial engages the stationary contact at the extreme positions. The 360 degree rotation insures fine adjustment. A brass bearing insures a true running dial and smooth action.

All figures and graduations are filled with brilliant white enamel. All brass parts nickel plated. Bakelite knob.

Resistance is 5 ohms, carrying capacity 2 amps.

No. 77 Parkin Dial Type Rheostat Postpaid \$1.75  
FOR SALE BY ALL LEADING DEALERS

Send for free catalog No. 4 describing our complete line.  
DEALERS: Write for proposition.

PARKIN MFG. CO., San Rafael, Calif.

## 3X ANNOUNCEMENT! 3X

Ease of motion in operation with scarcely a suggestion of applied force combined with accuracy and precision featured in our "3X" VARIOMETERS and VARIOCOUPLERS. Forms turned from well seasoned kiln dried wood specially for us.

3X VARIOMETERS are specially priced at \$5.00 each, postage prepaid; the VARIOCOUPLERS are \$4.00 each postage prepaid.

A postcard brings to you our illustrated price folder.

### ILLINOIS RADIO APPLIANCE COMPANY

3X

1426 East 70th Street  
CHICAGO, ILLINOIS

3X

# A Dependable Radio Telephone

For the Amateur

Here is the Complete Circuit—it Works—

Look over our New Catalog, Select the Necessary Apparatus and Order it from your Nearest Dealer

Radiotron Transmission combined with Kenotron Rectification and Magnetic Modulation constitutes the ideal amateur set

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CONDENSER**  
UC-1015  
Price \$5.40

**OSCILLATION  
TRANSFORMER**  
UL-1008  
Price \$11.00

**TRANSMITTER  
GRID LEAK**  
UP-1719  
Price \$1.10

**GRID  
CONDENSER**  
UC-1014  
Price \$2.00

**RADIOTRON  
POWER TUBES**  
UV-202  
5 watt output  
Price \$8.00  
(One or two may be used)

**MAGNETIC  
MODULATOR**  
UP-1346  
Price \$9.50

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UC-1014  
Price \$2.00

**ANTENNA  
AMMETER**  
UM-530  
Price \$6.00

**KENOTRON  
Rectifier Tubes**  
UV-216  
Price \$7.50 each

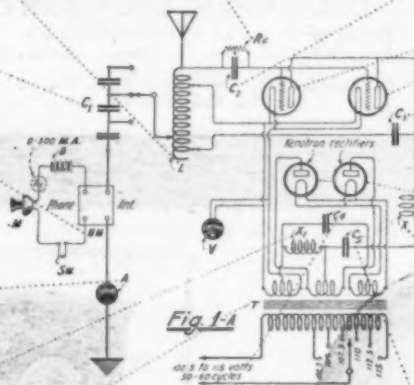
**FILTER  
REACTOR**  
UP-1626  
Price \$11.50

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Price \$25.00

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**RADIO  
FREQUENCY  
CHOKE**  
See page 15 of our catalog for complete how-to-make-it instructions.



The above circuit diagram is but one of many appearing in our new Catalog where the necessary apparatus for each circuit is clearly and accurately described. By following the advice given therein and purchasing the lead-

ing items listed, the amateur is assured of the maximum efficiency at a minimum of power consumption. And remember, that the new Magnetic Modulator makes the operation of a radio telephone set exceedingly simple.

If you have not already secured your copy of our combined instruction book and catalog send 25 cents today to

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**Radio**  **Corporation**  
of America  
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# For Radio Panels

## Waterproof Fibre Insulation

Hard fibre is the toughest dielectric known. Add to Diamond Hard Fibre the commanding quality of water-resistance and the combination produces Condensite Celoron—the last word in electrical insulation.

This remarkable material marks a new era in the wireless world. In addition to being waterproof, high in dielectric strength and light in weight, Condensite Celoron is insoluble, infusible and immune to the effects of climatic or atmospheric change. Read this Bureau of Standards test:

Wave Length	Approximate Frequency	Phase Difference	Dielectric
Meters	Cycles per second	Degrees	Constant-K
373	804,000	2.0	4.7
1,295	231,500	1.8	4.8
3,067	97,800	1.8	4.9

We supply Condensite Celoron in standard size sheets, rods and tubes ready for all machining purposes—for experts and amateurs. Sold by radio equipment dealers everywhere. If your dealer cannot supply you, write us.

### DIAMOND STATE FIBRE COMPANY

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## THERMO-COUPLE INSTRUMENTS FOR C-W

All long distance C.W. operators use thermocouple ammeters.

Precise electrical measurements are the basis for the successful operation of any C.W. set.

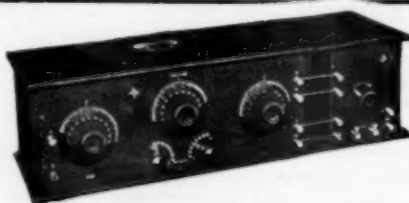
Unreliable and inaccurate instruments will result in the unreliable operation of any set.

Government Bureau of Standards tests have shown Jewell thermocouple instruments to be accurate and reliable.

**PRICE \$12.00**

ORDER FROM YOUR DEALER

**Jewell Electrical Instrument Co.**  
CHICAGO



**A** The "ACE" Type AVC  
**ACE** Regenerative Receiver **A**  
**E** Licensed under Armstrong Patent **E**  
#1,113,149

**Complete as illustrated . . . \$56.00**

This unit is admirably adapted for relay work over long ranges and combines the essential features of maximum signal amplification without distortion, maximum selectivity and the necessary flexibility which permits of rapid tuning of the various circuits. Unquestionably the ideal receiver for the Radio Amateur.

We also carry in stock at all times a complete line of High Grade Radio Supplies.

Send 5cts. in stamps for catalog to Dept. D.

**THE PRECISION EQUIPMENT CO.**

Peebles Corner,

Cincinnati, Ohio

Cable Address

Radio Call

"ACE" Cincinnati

8XB





## NEW MOULDED VARIOMETER

True to the Thousandth of an Inch



Price

\$6.50

Type M.V.G.

This variometer was unquestionably the feature of the Chicago Show. The compactness and neatness give instant appeal to discriminating users.

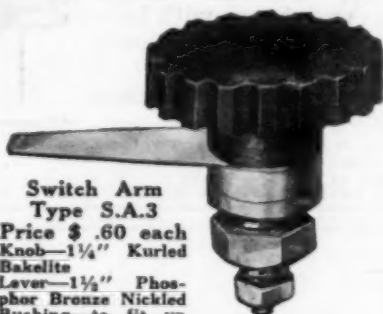
We claim that if anyone will go to his dealer, take one of these variometers in his hand, and operate it, he will instantly recognize its superiority thru its compactness, sturdiness, neatness, and absolutely correct weight. He will want to buy at once.

Constructed for either table or panel mounting. Fitted with  $\frac{1}{4}$ " rod for dial. Over-all size  $4\frac{1}{2}$ "  $\times$   $4\frac{1}{2}$ "  $\times$   $2\frac{1}{4}$ ". Wave length 150-750.

### Vario Coupler

The same inherent precision of manufacture, the same sturdiness, compactness, and neat appearance make this Vario-Coupler a fit companion for the M.V.G. Moulded Variometer. For either table or panel mounting. Size of base  $5 \times 5$ , height  $4\frac{1}{2}$ ". Tapped for single turn variation covering entire range. Green silk wire.

PRICE \$5.00



Switch Arm  
Type S.A.3

Price \$ .60 each  
Knob— $1\frac{1}{4}$ " Kurlid  
Bakelite  
Lever— $1\frac{1}{2}$ " Phos-  
phor Bronze Nickled  
Bushing—to fit up  
to  $\frac{3}{8}$ " panel

Type S.A.1 Price \$0.50 each  
same as above with 1" knob



Switch Arm  
Type S.A.4

Price \$ .60 each  
Knob— $1\frac{1}{4}$ " Fluted  
Bakelite  
Lever— $1\frac{1}{2}$ " Phos-  
phor Bronze.  
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to  $\frac{3}{8}$ " panel

Type S.A.2 Price \$0.50 each  
same as above with 1" knob

If your dealer does not carry them, write us, giving his name.

DEALERS: Order at once—the demand is big.

**THE MARSHALL-GERKEN COMPANY**

Manufacturers and Jobbers

131 RADIO BLDG.

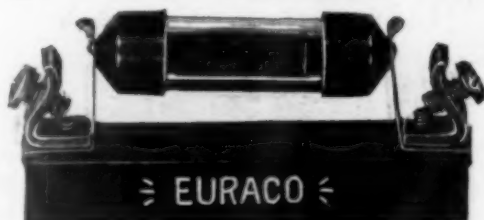
TOLEDO, OHIO, U. S. A.



## GENUINE MICA GRID CONDENSERS 60 CENTS

Designed to fit  
Standard  
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NEAT, HANDY,  
MOST EFFICIENT



Three Types  
.0001 mfd. } .60  
.00025 mfd.  
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COMPACT,  
INTER-  
CHANGEABLE

COMPOSED OF COPPER AND MICA SHEET, HAND MADE

If your dealer can't supply you, write us.

Interesting proposition for dealers.

ORDER YOUR APPARATUS THRU 'EURACO' MAIL ORDER SERVICE. ALL  
STANDARD APPARATUS IN STOCK. SHIPMENT MADE PROMPTLY UPON  
RECEIPT OF ORDER. NO DELAY. ALL GOODS SENT POSTPAID.

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### EUROPEAN RADIO COMPANY (EURACO)

(Manufacturers of Multi-Stage Amplifiers, C-W Equipment & Special Apparatus)

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"Ensign" 1/4"

## Say Boys! Here's **SOME** Good News

We know you will be glad to learn that on Oct. 1st  
**OUR HARD RUBBER BINDING POSTS WERE  
AGAIN REDUCED**

New list price of our ENSIGN post is 20c.—COM-  
MANDER 25c. These prices cover types with hole  
in neck. Holes in either size will take a telephone  
cord terminal.

**THINK THIS OVER—THEN ORDER SOME FROM YOUR  
DEALER TODAY**

We want a live radio dealer in every city in AMERICA to carry these  
novel posts. Get our latest discounts and cuts for advertising.



"Commander"  
3/8"

**THE H. H. EBY MFG. CO., 1302 Wallace St., Philadelphia, Pa.**

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Radio Operators are classed as Officers aboard ship. They receive good  
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You can become an expert in least possible time through our course. Com-  
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**Y.M.C.A. RADIO SCHOOL, 150 East 86th Street, New York City**

***Best Radio School in the East***

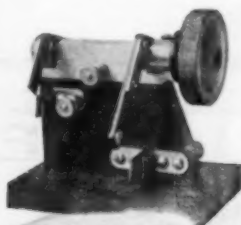


## “SIGNAL” Radio Apparatus Pleases Professional and Amateur —

Because it is built to the exacting requirements of the **professional** radio-electrician,

SIGNAL wireless products are **bound** to fulfill every requirement of the exacting **amateur**. And the name SIGNAL is the only thing to be certain of in buying!

### Aerial Change-over Switch

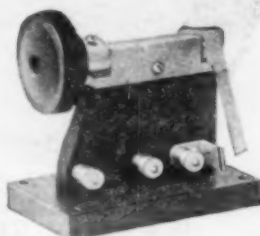


Transmitting Side

Reduced to fewest words, the superiority of this SIGNAL Switch is due to the fact that it has the good features found in highest priced amateur change-

over switches, plus all the qualifications of the modern antenna switch. Lack of room prevents recounting these features here; one point alone should suffice, however, as an example: That is the arrangement whereby the aerial is drained of any accumulated charge, before the switch reaches receiving position. Search and you'll find this feature only in the most expensively built commercial

aerial switches. And any operator who is “wise” to the nasty kick in telephone receivers, when shifting quickly from send to receive will appreciate this SIGNAL advantage.

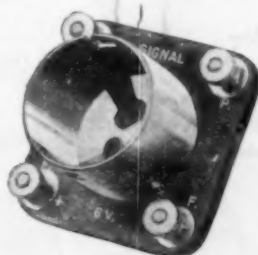


Receiving Side

SIGNAL advantage.

### The Signal “V.T.” Socket

The only vacuum tube socket on the market today that will take any of the standard four-prong tubes, either Detector, Amplifier, or Oscillator, without changing or adjusting. And this is not the only distinguishing mark of this SIGNAL socket—the others are all told in the latest SIGNAL Bulletin of High Class Wireless Apparatus, which is yours for the asking.



Write for the SIGNAL literature now—it is free. Address

**SIGNAL ELECTRIC MANUFACTURING COMPANY**

Menominee, Michigan

# Improved Operation of Vacuum Tubes on Alternating Current



Model 429 Low Range A.C. Voltmeter  
4 1/2 inch Diameter

is the aim of all progressive enthusiasts.  
YOU will obtain it if you use a

## Weston

Model 429.

### Low Range A. C. Voltmeter

to measure and adjust the filament voltage. The Model 429 Low Range Voltmeter has an exceptionally high resistance, making it ideal for use with tubes.

Instruments of this size are available as A.C. Ammeters, Milliammeters and Voltmeters; D.C. Ammeters, Milliammeters, Voltmeters and Millivoltmeters; A.C. and D.C. Wattmeters; and Radio Frequency Ammeters. *Bulletin sent on request*

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A marvelously easy to understand instruction book on most advanced radio methods, because it describes in detail the unusual mechanical and electrical features and simplicity of the complete ABC line.

Sixteen pages, clearly illustrated, in two colors. Every price quoted in this catalog represents a new low level for apparatus of recognized quality. Send 10c for latest ABC catalog "Professional Radio Equipment at Amateur Prices." Request Catalog CQ 11.

WIRELESS EQUIPMENT CO. Inc.  
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## REFILLABLE



### RELIABLE—VARIABLE WIRELESS B BATTERY

Especially designed for vacuum tube work on plate circuits, and is guaranteed to be perfectly noiseless.

Above cut shows part of cover cut away to illustrate convenience in inserting a new cell should one go dead. No soldering iron necessary. Replacements furnished for 25c each. Send us your order to day. **Dealers Write**

**22 1/2 V. Battery—Postpaid—\$3.00**

**Eastern Ohio Radio Mfg. Co.**  
East Palestine, Ohio.



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FOR INTELLIGENT AMATEURS THAT WANT TO BUILD  
THE BEST REASONABLY

Now at leading radio dealers, including

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NEWARK	A. H. Corwin & Co., 4 West Park St.
PHILADELPHIA	Arrow Electric Co., 5018 Baltimore Ave. Philadelphia School of Wireless Telegraphy, 1533 Pine St. Quaker Light Supply Co., 728 Arch St.
DETROIT	Detroit Electric Co., 434 Shelby St.
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THE ABOVE CONCERNS ARE RELIABLE AND ESTABLISHED. NEW ITEMS  
THEY STOCK ARE WORTHY OF YOUR CONSIDERATION.

*22 subjects are covered by the prints, full details  
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## IMPORTANT

Our Mr. Claude Golden has started a tour of the country to show the prints personally, he will be in Omaha starting Nov. 6th, Winnipeg 13th, Edmonton 20th, Calgary 23rd, Vancouver, B.C. 27th, Seattle Dec. 4th, Portland 11th, San Francisco 18th, Oakland 25th, Sacramento Jan. 1st, (Other dates in next ad.)

Amateurs, schools, dealers, etc., that would like to inspect the complete set of blue prints, please write to our New York office for an appointment, no obligation on your part.

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# Federal Head Telephones



No. 53W and 52-W  
HEAD TELEPHONES

Just the Head Telephones desired by the discriminating Experimenter who wants real value.

No. 53-W and 52-W were developed under the rigorous specifications of the Army and Navy for wartime use and are now available to the Amateur Field.

No. 53-W Federal Head Telephones  
2200 ohm ..... \$8.00

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**Federal Telephone & Telegraph Co.**  
Buffalo, New York

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Write for complete list. Reliable Service. Prompt Shipment

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## With Westinghouse Simplified Receiving Apparatus

A radio set is easily and  
quickly installed by novice,  
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Receiving Set No. 1 consists of a highly efficient single-circuit tuner; a supersensitive crystal detector; a set of head phones; and a complete antenna outfit. It has a wave-length of 180 to 700 meters.

Receiving Set No. 2 consists of a single-circuit tuner; a three-tube, two-stage detector-amplifier; four vacuum tubes (one spare); a loading coil; two dry batteries; a storage battery, head phones; and a complete antenna outfit.

It has a wave-length range of 180 to 700 meters. The addition of the loading coil allows the reception of signals on 1600 to 2800 meters wave length, such as Arlington time.

Folder 4476 gives interesting details. Send for it.

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Type RA Tuner.....	\$65.00
Type DB Crystal Detector...	5.00
Brandes Superior Phones...	8.00
Receiving Antenna Outfit..	7.50

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For Distant Reception and Loud Speaking

Type DA Detector Amplifier	\$65.00
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### FOR BATTERY CHARGING

Rectigon Battery Charger...	\$15.00
Extra bulb for same.....	\$4.00

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# Westinghouse

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6 Volt 80 A. H.  
"COMBAT"

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charges—

on any apparatus ordered  
from us to any Amateur in  
the third district.

***Everything in Radio***



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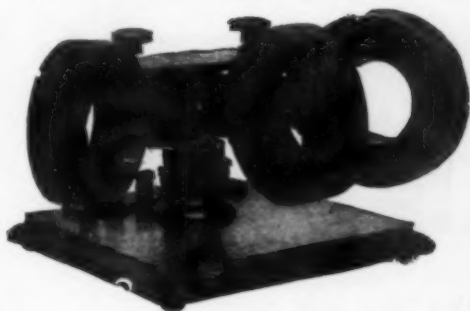
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MESCO #51 KEY

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L-104 Regenerative loose-coupler .....	\$29.50	\$20.65
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115 Galena Detector .....	1.60	1.00
117 Galena detector .....	2.15	1.50
110 Silicon detector .....	2.10	1.45
#51 Mesco transmitting key .....	1.80	1.10
Mesco 1K.W. transmitting key with 1/4" sterling silver contacts ..	4.00	2.75
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Solid brass binding posts—black finish—with screw .....	.20	.10
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Aluminum VT Socket on composition base .....	1.50	1.20
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Same as above without taps .....	2.25	2.00
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T-V antenna switches—slate bases .....	4.50	3.25
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Baby knife switches—S.P.S.T. ....	.25	.18
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DeForest Type OT-10 D.C. Radiophone complete with tubes and motor-generator .....	295.00	250.00

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 LONG DISTANCE Reception at LOW WAVELENGTHS  
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**ANNOUNCING**

THE NEW Super-Sensitive Radio-Audio Frequency Amplifier for Spark, Phone and C.W. Reception, made possible by RADICAL DEPARTURE in Radio Frequency Transformer Design. (Pat. Pending.)

THE ANSWER to the ever increasing demand for a PRACTICAL SHORT WAVE, HIGHLY SENSITIVE, RADIO FREQUENCY AMPLIFIER.

The result of years of research work in radio frequency amplification.

No "Howling". Simple in Operation. Absolutely Dependable.

Type JM, Radio-Audio Frequency Amplifier, furnished with two "plug in" Radio Frequency Transformers. (2 step Radio, det. 2 step Audio) \$95.00

"Plug in" Radio Frequency Transformers furnished for following wave length ranges: 150-750, 750-2000, 2000-5000, 5000-12000



**RADIO INSTRUMENT COMPANY**

Hutchins Bldg., 10th & D, N. W.      Washington, D. C.

GET THE NEW COMPLETE RADIO CATALOG OF

**CRAIG & LOUGHBOROUGH**

CINCINNATI, OHIO, FREE. IT DESCRIBES RADIO  
 TELEPHONES FROM 10 WATTS TO 2 K.W., \$45 TO  
 \$4000; SPARK TRANSMITTERS, RECEIVING EQUIP-  
 MENT, ANTENNA MATERIALS, AND THE MOST COM-  
 PLETE LINE OF PARTS EVER OFFERED. PRICES  
 LOW. QUALITY AND SERVICE OF THE BEST.

**PANELS CUT TO ORDER—A NEW SERVICE**  
 We cut panels to exact size from Bakelite 1-16 to 3/4", Formica 1-16 to 3/4", Fibre 1-16 to 1/2" thick.  
 Drilling Holes up to 1/4" @ 3c each.  
 Engraving—Letters or figures—5c each, 150 scale—75c each.

**NEW WIRELESS LOOSE LEAF CATALOG**  
 Send 10c, stamps or coin  
 —100 pages all wireless  
 sending and receiving sets.  
 You get regular up-to-date  
 radio bulletins.

**The KUEBLER RADIO CO.**  
 Successors to  
 Marshall-Gerken Co.  
 Retail Dept. 131 Gibbs Bldg.  
 Toledo, Ohio

**No. 122 Cord Tip Jack**



*Attractive proposition to dealers*

Send for Bulletin No 7

**A. W. BOWMAN & CO.**

154 West Lake St.,      Chicago, Ill.  
 Factory, Cambridge, Mass.

# Buy It From The Navy

Surplus Navy Radio Materials for sale at attractive prices.

## RECEIVING SETS

Suitable for receiving ship,  
amateur, or long-wave signals.

## SPARK TRANSMITTERS

Complete with motor generators,  
or gas engine driven generators.

ACCESSORIES (except Vacuum Tubes) of every description  
suitable for experimental or research purposes.

This is an EXCELLENT OPPORTUNITY for Colleges, Radio-  
Schools and Amateurs to buy NAVY—R-A-D-I-O—Equipment  
at ATTRACTIVE PRICES.

*Write today for Navy Radio Catalogue No. 601-81.*

The surplus materials the Navy has available for sale have  
been grouped as shown below and catalogues describing these  
materials will be sent on your request.

### List of Surplus Materials

All Materials.	Electrical Equip-	Precision.
Aeronautical Equip-	ment and Sup-	Oils and Greases.
ment.	plies.	Paint and Paint
Aluminum.	Furniture.	Materials.
Bath Room Fittings	Hardware.	Provisions.
and Plumbing	Iron.	Radio Equipment.
Supplies.	Lead.	Rope and Twine.
Blankets.	Machinery.	Stationery and
Boats.	Mess and Galley	Office Equipment.
Books.	Equipment	Steel.
Brass.	(Kitchen and	Tin.
Canvas and Tents.	Dining Room.)	Tools — Hand, Ma-
Chemicals.	Monel.	chine and Con-
Cloth and Textiles.	Musical Instruments.	tractors.)
Clothing.	Navigating and In-	Valves and Fittings.
Copper.	struments of	Zinc.

## CENTRAL SALES OFFICE

Navy Dept.,

Washington, D. C.

## 'Co-Operation'

Buy your radio parts and finished instruments from this association and secure prompt, satisfactory SERVICE as well as considerable money SAVING. Try us with a trial order or send stamp for detailed information. You can secure membership without cost and participate in the associations profits on any radio purchase you make.

Dept. Q-1

**BALDWIN PHONES (Reduced Prices)**  
 Type C. small style.....\$13.75  
 Type E. ultra-sensitive..... 15.00  
 Type F. very small style..... 16.25

**STORAGE BATTERIES.**  
 Marko 6 v. 20-40 ampere hour...\$14.60  
 Marko 6 v. 40-60 ampere hour... 17.00  
 Marko 6 v. 60-80 ampere hour... 21.50  
 Marko 10 v. 60-80 ampere hour... 40.00

**AMPLIFYING TRANSFORMERS.**  
 Federal, small compact.....\$6.75  
 Radiotron, UV-712 model..... 7.00  
 Saco-Clad, very small..... 5.00  
 Acme, new mounting..... 5.00  
 Clapp-Eastham, fully mounted..... 4.00

**VACUUM TUBES.**  
 Radiotron UV-200 detector.....\$5.00  
 Radiotron UV-201 amplifier..... 6.50  
 Radiotron 5 watt power tube..... 8.00  
 Moorhead Electron relay..... 5.00  
 Moorhead Amplifier..... 6.50

**MURDOCK CONDENSERS.**  
 .001 mfd. in rubber case.....\$4.75  
 .001 mfd. transparent case..... 4.50  
 .0005 mfd. transparent case..... 4.00  
 .001 mfd. for panel mounting..... 4.00  
 .0005 mfd. for panel mounting.... 3.25

**Mutual Purchasers Assn.**

2-4 Stone St., New York City

## 125 Watt 500 Volt Generators

1725 R.P.M.—\$35.00

Ball Bearing—42 Segments in Commutator—No Hum.

PARTS: Exactly as used in above machine except no winding on fields or armature.....\$18.00

Full details as to winding supplied  
 MOTORS: 1/4 H.P. 1725 R.P.M.  
 110 volt, 60 cycle Westinghouse  
 new .....\$18.40

**THE ELECTRIC MOTOR &  
ENGINEERING CO.**

2nd St. S. W. and E. & O. R. R.  
**CANTON, OHIO**

The Hit of the ARRL Radio Show at Chicago Was the  
 "J-K" MICROPHONE



Type M-3, Hand  
 \$6.00

Type M-2, Panel  
 \$4.00

Type M-1, unit  
 only \$3.00

You CW men  
 after DX records  
 should ask for  
 them at your  
 dealers or direct  
 from

Type M-3  
 Priced Right and Made Right  
 JOY and KELSEY

4021 W. KINZIE ST., CHICAGO, ILL.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS



# Do You Need a Log?

Record of Reception

[illegible]

Of course you do and always did, but you could not buy a really good one.

To fill this need we have produced a REAL DX LOG and we KNOW you will like it.

The book contains 100 regular pages, 50 for recording transmission and 50 for reception, all bound in a neat cover which opens flat on the table. There are spaces for entering WEATHER, QSS, DISTRICTS MOST AFFECTED BY QSS, CHANGES OF APPARATUS, DATA ON STATIONS CONCERNED, and every bit of information necessary for a complete station report as would be required by the A.R.R.L.

In addition there are pages for listing your DX records both transmitting and receiving, the air line miles covered, and the miles per watt. A number of graph sheets are also provided, so that a curve of any operating condition may be plotted, such as QSS curves, daylight effects, audibility curves etc. CAN YOU BEAT IT OM???

Order one of these LOG BOOKS today and if it is not "ALL THAT THE NAME IMPLIES" just return it and your money will be refunded.

IDEAL LOG BOOK .....	\$1.50
IDEAL LOG FOR RECEIVING ONLY .....	\$1.50

## And Look at These Prices

## IDEAL EQUIPMENT

1 MFD 1000 Volt Condenser .....	\$2.00
2 MFD 500 Volt Condenser .....	1.50
1 Henry Two Coil Choke .....	7.00
1 Henry Single Coil Choke .....	5.00
Type MGF Filter .....	15.00

## IDEAL MOTOR-GENERATORS

500 Volt 100 Watt	.....	\$70.00
500 Volt 200 Watt 3400 RPM	.....	75.00
1000 Volt 500 Watt Generator	.....	140.00

## ACME C-W EQUIPMENT

50 WATT C-W Transformer .....	\$13.50
200 Watt C-W Transformer .....	18.00
500 Watt C-W Plate Transformer ...	22.50
150 Watt Filament Heater .....	14.40

## C-W CONDENSERS

Wireless Shop .0004 Mfd	\$6.00
Wireless Shop .0006 Mfd	7.50
Wireless Shop .0008 Mfd	9.00

## FEDERAL MICROFONES

280-W	Hand Microphone .....	\$6.25
262-W	Panel with bracket .....	4.75
263-W	Panel Mounting .....	4.75

## RADIOTRON TUBES

5 Watt UV-202 .....	\$7.25
50 Watt UV-203 .....	27.00
Singer 37.5 Watt .....	20.00

## ACCESSORIES

Ideal Socket for UV-203 .....	\$2.50
Socket for UV-202 .....	1.35
.002 Mfd 1000 volt Conds. ....	1.80

## RADIO METERS

0-100, 0-300 MA D.C. ....	\$5.00
0-1, 0-3 Thermo Ammeters .....	11.00
0-500 Volts D.C. ....	15.00
0-1200 Volts D.C. ....	23.00

## Z-NITH EQUIPMENT

C-W Regenerator .....	\$55.00
AGN-2 Detector—Amp. ....	89.25

## MOORHEAD TUBES

Electron Relay .....	\$4.50
Amplifier-Oscillator .....	5.85

**FORMICA**

12x12x $\frac{1}{8}$ "	.....	\$2.50
12x18x $\frac{1}{8}$ "	.....	4.00
6x18x $\frac{1}{8}$ "	.....	2.50

## “9ХАН”

SEND 5c FOR OUR C-W CATALOG

## “9ХАН”

**IDEAL APPARATUS CO., 1901 E. La. St., Evansville, Ind.**

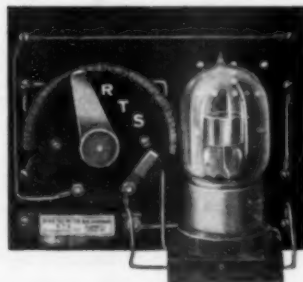
# THE WONDERFULLY PERFECTED RTS Standard Detector Panel



(Front)

## Ten Points of Superiority

- 1—Silver Plated Wire
- 2—Machine Engraved Scale
- 3—Resistance, 8 Ohms
- 4—Small Wound Resistance
- 5—Grid Condenser and Leak accurate
- 6—Sure Contact Socket
- 7—Socket Used as a Standard
- 8—Decreased Resistance in Leads
- 9—Machined Letter Engraving
- 10—All Posts and Parts Perfectly Set



(Back)

**5.95** Without Tube Pre-  
paid by Insured  
Parcel Post.

**RTS**

Write today for circular giving  
full details.

Install this efficient R.T.S. Panel and you possess a correctly designed Detector Panel capable of producing signal strength unequalled by any other tested in our laboratory. It is guaranteed. Write for circular.

## RADIO TESTING STATION

DEPT. 3

25 STURGES ST.,

BINGHAMTON, N. Y.

## Antenna Insulators

Will stand 500,000 volts after immersion in water for 48 hours. Tensile strength 2,000 pounds.

Longer Than the Insulator Sold as 10"  
Stronger Than the Insulator Sold as 10"

**AND ONLY 90c APIECE**

This price for August and September only.  
Buy 'em now for your new aerial.

Burgess #4156 22½ Volt "B" Batteries  
**\$1.75 Each**

While they last—Limited Supply.

### "73" Puncture Proof C.W. Condensers

1 Mfd 1500 Volts.....	\$4.00
2 Mfd 1500 Volts.....	5.00
5 Mfd 1500 Volts.....	10.00
2 Mfd 2500 Volts.....	15.00
2 Mfd 4000 Volts.....	23.00
5 Mfd 2500 Volts.....	30.00

Write for descriptive Circular.

**The Radioelectric Shop Co., Dept. Q. 10**  
**919 Huron Road Cleveland, Ohio**

## Prepared Radio Measurements

with  
**Self Computing Charts**

by *Ralph R. Batcher*

A new WIRELESS PRESS book. Published as a real help to amateur radio. Obviates the necessity of long and involved mathematical calculations. A ruler or transparent triangle takes the place of intricate figuring and the results will be correct every time.

**PRICE \$2.00**

**The WIRELESS AGE**

*The magazine that meets  
all your expectations.*

When its new you find it in the AGE. Every step in radio progress is fully and carefully described. You miss a lot of good things unless you read the AGE. \$2.50 per year, Postage outside U. S. 50c.

**SPECIAL OFFER ONLY**

Prepared  
Radio  
Measurements

**&**

The  
Wireless  
Age  
1 Year

**\$4.00**  
Outside U. S.  
50c. Extra

This offer expires Dec. 15, 1921.

**WIRELESS PRESS INC.**  
**328 Broadway, New York**

# AMATEURS SAY TRY "WECO"

SERVICE THAT GIVES QUALITY AND SATISFACTION

Radiotron Detectors UV200 .....	\$5.00
Radiotron Amplifiers UV201 .....	6.50
Radiotron Transmitters 5 watt Power Tube UV202 .....	8.00
Radiotron Transmitters 50 watt Power Tube UV203 .....	30.00
Radiotron Transmitters 250 watt Power Tube UV204.....	110.00

## RADIO CORPORATION C.W. ACCESSORIES

Oscillation Transformer UL 1008.....	11.00
Magnetic Modulation ( $\frac{1}{2}$ to $1\frac{1}{2}$ amp.) UP1346 .....	9.50
Magnetic Modulation ( $1\frac{1}{2}$ to $3\frac{1}{2}$ amp.) UP1357 .....	12.00
Magnetic Modulation ( $3\frac{1}{2}$ to 5 amp.) UP1367 .....	17.00
Filter Reactor (160 milliamp.) UP1626 .....	11.50
Filter Reactor (300 milliamp) UP1627 .....	15.75
Plate Circuit Reactor UP415 .....	5.75
Filter Condenser $\frac{1}{2}$ mfd. 750V. UC1631 .....	1.35
Filter Condenser 1 mfd. 750V. UC1632 .....	1.85
Filter Condenser $\frac{1}{2}$ mfd 1750V. UC1634 .....	1.50
Filter Condenser 1 mfd. 1750V. UC1635 .....	2.00
Transmitting Grid Leak (5 watt tubes) 5000 ohms UP1719 ....	1.10
Transmitting Grid Leak (50 and 250 watt tubes) 5000 ohms UP1718 .....	1.65
Antenna Ammeters 0-2.5 amp. UM530 .....	6.00
Antenna Ammeters 0-5 amp UM533 .....	6.25
Sending Key UO809 .....	3.00
Microphone Transformers UP414 .....	7.25
Filament Rheostat (UV202) P.R. 535 .....	3.00
Filament Rheostat (UV203-204) P.T. 537 .....	10.00
Rotary Grid Chopper P.X. 1638 .....	7.25
Shaft Bushing for $\frac{1}{4}$ " or 5-16" Shaft .....	.20
Antenna Series Condenser 7500V. .0003, .0004, .0005 mfd. UC1015	5.40
Plate and Grid Condenser 3000V., .002 mfd. UC1014 .....	2.00
Special Condenser 10,000V., .000025 mfd. UC1803 .....	5.00
Special Condenser .002 mfd. 6000V., UC1806 .....	7.00

## OTHER MAKES

General Radio Sockets #156.....	1.50
"Shramco" Rheostats 6 amp. capacity .....	2.00
"Wimco" Inductance and Clips 25 turns.....	10.00
Federal Hand Microphone Sets #260W .....	7.00
Federal Grid Resistance Units 5,000 ohm .....	2.30
Federal Grid Resistance Units 10,000 ohm .....	3.50
Federal Condensers 1,000V. 1 mfd. ....	2.00
Western Electric 1,000V., 1mfd., #23A.....	2.50

We carry a full supply of Remler, Radio Corporation, Clapp-Eastham, Federal, Murdock, and many other makes. Jobbers for Radio Corporation and Clapp-Eastham. Dealers write for proposition.

*Write Us for Our "SPECIAL" for November and December*

**WHITALL ELECTRIC COMPANY**  
WESTERLY, R. I.

## Short Wave Efficiency!



Can only be had by using variometers which are scientifically constructed.

The market is full of variometers more or less indifferently designed which are built solely to sell, without a true appreciation of what is necessary in their construction.

Consult any authority and he will tell you that you can tune with either capacity or inductance, BUT that inductance is not only preferable but correct theoretically. Then think it over and see whether you will buy moulded variometers (the better the dielectric the greater the capacity) or whether you will buy "CINO". Over five hundred sets in use today and on the market only six months!

Variometer parts only.....\$2.50

Variometers wound not assembled 4.50

Variometers complete plate or grid 6.00

CROSLY PORCELAIN SOCKETS.....\$0.60

Variocoupler parts only.....\$2.50

Variocoupler wound not assembled 4.50

Variocouplers complete..... 6.50

YOUR DEALER HAS THEM



CINO RADIO MFG. COMPANY

218 West 12th Street.

CINCINNATI, OHIO.



## KEYSTONE WIRE

Wire for every Wireless Purpose

### MAGNET WIRE

We are prepared to furnish best grade magnet wire on  $\frac{1}{4}$  and  $\frac{1}{2}$  lb. spools at the following prices:

Size B & S Ga.	PRICE PER $\frac{1}{4}$ LB. SPOOL			
	Single Cotton	Double Cotton	Single Silk	Single Enameled
No. 22	\$0.56	\$0.68	\$0.62	\$0.45
No. 24	.60	.77	.67	.47
No. 26	.60	.88	.71	.49
No. 28	.75	1.10	.85	.52
No. 30	.85	1.24	.97	.53
No. 32			1.15	.55
No. 34			1.52	.59
No. 36			1.77	.69

Price of  $\frac{1}{2}$  lb. spools double above list.

All prices are net and include cost of spool and delivery charges via Parcel Post to any Post Office address in the United States; safe delivery guaranteed.

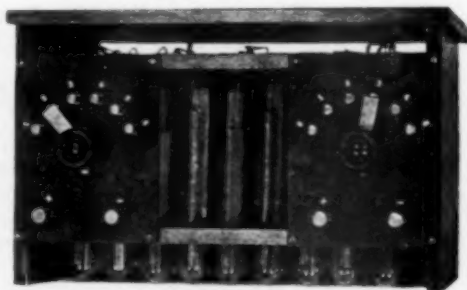
Send for Circular 21-A giving prices on other sizes, insulations and quantities of Magnet Wire. This circular lists "WIRE FOR EVERY WIRELESS PURPOSE." Dealers-Write for our proposition

KEYSTONE WIRE COMPANY

P.O. BOX 120



SCRANTON, PA.



### "B" BATTERY TROUBLES ENDED

Our STORAGE "B" BATTERIES give years of REAL service and save you REAL money in the end. One charge will last from three to six months while in the detector plate circuit and they can be recharged in about two hours. The plates cannot sulphate or buckle and are not harmed from short-circuiting, overcharging or standing idle.

Two styles are supplied, one as illustrated, with control panels allowing adjustments of 1.35 volts from fifteen volts up, and the other plain with clips for adjustment. Rectifiers for charging, chemicals and directions are included with each style. All that is needed to put the battery into service is about one quart of distilled water.

The following prices are for batteries with control panels.

24 cell 32 volts.....	\$10.00
36 cell 48 volts.....	12.00
50 cell 68 volts.....	15.00

The following prices are for plain batteries with clips for adjustment. 32 volts, \$8; 48 volts, \$10; 68 volt, \$12.

Send in your order today with the privilege of receiving money back if not satisfied after sixty days trial. Further information upon request.

KIMLEY ELECTRIC COMPANY

290 Winslow Ave.,

Buffalo, N. Y.



# DO IT NOW

Are you missing part of the fun of the game because of poor apparatus, old apparatus or lack of apparatus you need? Are you proud of your equipment? Are you getting as good results as the other fellow—the best results? You should and can with the right apparatus. Check it over. Stock up. Make your set efficient, complete, up to the minute, and *do it now*. Run your eye down this list, check the items you need and order them.

DeForest reversible	
Rheostats .....	\$1.75
Remler Rheostats .....	1.75
Remlers Jr. Rheostats .....	1.00
Murdock New Type revers- ible Rheostats .....	1.00
Remler large nonbearing sw.	.65
Remler small nonbearing sw.	.45
Wireless Shop Panel Mounting Condensers	
DeForest Condensers	
Murdock Condensers	

If you don't see what you want ask for it. Our stock is complete. Every piece fully guaranteed, and the lowest prices consistent with high quality, long wear and perfect satisfaction. You'll like our apparatus and our way of doing business. *Try it now.*

## CALIFORNIA ELECTRIC SUPPLY CO.

643 Mission St.

San Francisco, Cal.

### RADIO MAGNAVOX

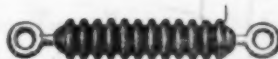
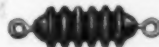
With New Type 14" horn \$45.00  
One stage amplifier with-  
out case..... 15.00

### MURDOCK PHONES



2000 Ohms .....	\$4.50
3000 Ohms .....	5.50
With new type head bands	
50c extra.	

### INSULATORS



10" .....	\$1.00
4" .....	.50
Ball .....	.40

### SOCKETS

Remler VT .....	\$1.50
DeForest VT .....	1.40
Murdock VT .....	1.00
General Radio VT .....	1.50

### TUBES

Moorhead E R Detector ..	\$5.00
Moorhead VT Amplifying.	6.50
Radiotron Detector .....	5.00
Radiotron Amplifying....	6.50
Radiotron Power .....	8.00

### TRANSFORMERS

General Radio Amp.....	\$5.00
Federal Amp.....	7.00
General Electric UV 712	
Amp. ....	7.00

## RADIO SUPPLIES THAT R RIGHT

# ATLAS RADIO PRODUCTS

for efficiency

WHY YOU SHOULD BUY ATLAS RADIO PRODUCTS

## UNMOUNTED

Popular opinion has demanded that really efficient amplifying, modulation, filament heating and C.W. power transformers be put on the market and made available to the amateur. The great majority of these instruments on the market heretofore, were highly inefficient, and have had a power factor in the neighborhood of 50%. ATLAS transformers will henceforth be rated on output, and will use double windings, larger windings, larger wire and larger cores in order that the power factor be as high as possible. This is being done at 100% increase in cost of production, but the selling price of the instruments will not be changed.

**GUARANTEE:** Run an efficiency test with any other transformer on the market and determine its power factor; then run the same test with Atlas transformers, and if they do not prove more efficient your money will be refunded upon request.

### ATLAS AMPLIFYING TRANSFORMERS

Mounted .....	\$5.00
Semi-mounted .....	4.00
Unmounted .....	3.50

Parts for same—	
Primary and secondary .....	2.50
Core .....	1.00
Four aluminum legs .....	.50
Panel and binding posts .....	1.00

### ATLAS MODULATION TRANSFORMERS

Mounted .....	\$5.00
Semi-mounted .....	4.00
Unmounted .....	3.50

Parts for same—	
Primary and secondary .....	2.50
Core .....	1.00
Four supporting legs .....	.50
Panel and binding posts .....	1.00

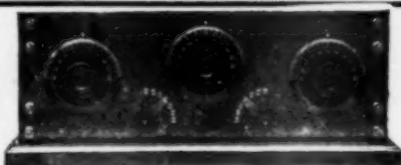
**SPECIAL SORTED, TESTED AND GUARANTEED VACUUM TUBES, ALL MAKES AT LIST PRICES**

AMATEURS: Send 10 cents for Atlas catalogue.  
DEALERS: Send for Catalogue and Discount Schedule

**THE AMERICAN RADIO SALES AND SERVICE CO.**  
**MANSFIELD, OHIO, U. S. A.**

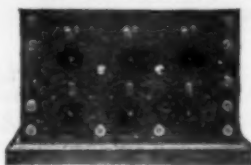
## Hygrade Specials Save You Money

Paragon Control Panel with Radiotron tube.....	\$10.50
Audiotron Tube—Two Filaments...	5.50
Radiotron U.V. 200 Detector Tube With a Combination Grid Leak Condenser .....	5.00
No. 55 Murdock 2000 Ohm Wireless Head Sets.....	4.00
No. 56 Murdock 2000 Ohm Wireless Head Sets.....	4.50
No. 55 Murdock 3000 Ohm Wireless Head Sets.....	5.00
No. 56 Murdock 3000 Ohm Wireless Head Sets.....	5.50
.0005 M.F. Grid Condensers.....	.25
.002 M.F. Phone Condensers.....	.25
Paragon V.T. Sockets, New Type...	.95
Binding Posts Rubber Cap, per doz.	.90
Cyclone 22½ Volt Small B Battery	.98
Cyclone 22½ Volt Large B Battery	1.75
45 Volt Variable B Battery.....	3.00
Marko Storage Batteries	
6 Volt 20 to 40 Amp.....	\$12.50
6 Volt 40 to 60 Amp. Ford Type.....	15.00
6 Volt 40 to 60 Amp. Large Type.....	16.00
6 Volt 60 to 80 Amp. Ford Type.....	18.50
6 Volt 60 to 80 Amp. Large Type.....	20.00
6 Volt 20 to 40 Amp. U. S. Battery.....	10.00
6 Volt 40 to 60 Amp. U. S. Battery.....	13.75
We Guarantee every Order Shipped within 12 Hours.	
The above prices are F. O. B. New York	
Hygrade Electrical Novelty Co.	
41 West 125th. Street,	New York



**UNWIRED  
REGENERATOR**

**\$22.50**



**DETECTOR  
AND  
2 STAGE  
AMPLIFIER**

**With 3 Licensed  
Tubes Matched to  
Transformers** **\$25.00**  
**\$40.00**

These apparatus are constructed with the best materials and workmanship. They have no superior at any price. Apparatus fully guaranteed. Send for descriptive bulletin immediately.

**FREDERICK WINKLER, Jr.**  
304 COLUMBUS AVENUE  
New York City, N. Y.

# FORMICA

## Sheets, Rods, Tubes

Made From Anhydrous  
Redmanol Resins

Insist on getting the best insulating material  
in your equipment and apparatus.

FORMICA is approved by the Bureau of En-  
gineering, U. S. Navy, and is used by the lead-  
ing manufacturers of radio apparatus.

**Highest Insulation Resistance**  
**Lowest Power Losses**  
**Splendid Appearance**  
**Excellent Machining Qualities**

*The following dealers can supply you  
with FORMICA sheets, tubes and  
rods.*

Manhattan Electrical Supply Co.,  
17 Park Place, New York, N. Y.  
Clapp-Eastham Company,  
139 Main St., Cambridge, Massachusetts.

The Radio Electric Company  
3807 Fifth Ave., Pittsburgh, Pa.  
Pennsylvania Wireless Mfg. Co.,  
507 Florence Ave., New Castle, Pa.

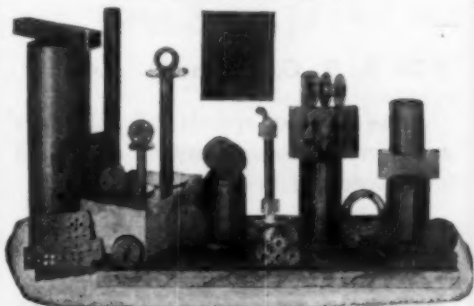
Radioelectric Company,  
919 Huron Road, Cleveland, Ohio.  
The Wireless Manufacturing Co.,  
Canton, Ohio

The Precision Equipment Co.,  
2437 Gilbert Ave., Cincinnati, Ohio  
Detroit Electric Company  
434 Shelby Street, Detroit, Michigan

The Wireless Shop,  
511 West Washington St.,  
Los Angeles, California

Leo J. Meyberg Company,  
428 Market St., San Francisco, Cal.  
Northeast Radio Service Company,  
Seattle, Washington.

The Formica Insulation Co.  
CINCINNATI, OHIO



## RADIO MAGNAVOX

*The  
reproducer  
with the  
movable coil*



Type R  
\$45.00

Type R  
\$110.00

No set complete without one

Send for  
**FREE**  
Diagram

Every QST man who takes  
pride in his knowledge of "the  
art", should get this diagram  
for his own information.

It illustrates the wiring and  
construction of the Radio MAG-  
NAVOX. It also shows the  
famous movable coil, a unique,  
patented MAGNAVOX feature  
which makes the MAGNAVOX  
the one instrument that will re-  
produce signals of any strength,  
without distortion and without  
injury to the apparatus.

Diagram neatly printed on  
pasteboard card, with instruc-  
tions for hooking up and oper-  
ating the MAGNAVOX, free.  
Send for it to-day.

Dealers  
write for  
proposition

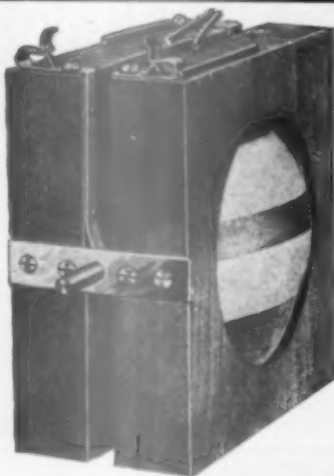


REG. U.S.  
PAT. OFF.

**THE MAGNAVOX CO.**

GENERAL OFFICES & FACTORY  
**OAKLAND, CALIFORNIA**

NEW YORK OFFICES  
370 SEVENTH AVE. PENN. TERMINAL BLDG.



## THREE HUNDRED OF THESE VARIO- METERS SOLD AT RETAIL DURING AUGUST AND NOT ONE CRITICISM

There are countless types of variometers on the market. We know of none that measures up to the standard of efficiency of our new variometers and vario-couplers. The stator forms of our variometers are accurately turned from seasoned hard wood, thoroughly impregnated with special insulated varnish. The windings are securely fastened to prevent any possible chance of loosening. The coupling is exceedingly close.

The instruments are furnished, both mounted and unmounted.

	Special Price
No. A600 Plate Variometer less knob and dial.....	\$4.90
No. A601 Plate Variometer with knob and dial.....	5.90
No. A602 Grid Variometer less knob and dial.....	4.90
No. A603 Grid Variometer with knob and dial.....	5.90
No. A604 Vario-Coupler less knob and dial.....	4.90
No. A605 Vario-Coupler with Corwin knob and dial..	5.90

Our radio catalog No. 16—just out—embracing 275 pages is beyond question the largest and most complete radio catalog ever put between the covers of two pages. Practically everything worth while in radio is comprehensively listed and described in this catalog. There are countless pages of hook-ups and special information on radio telephone transmitting sets and receiving sets. The entire catalog of the Radio Corporation, with detailed data on transmitters and all the diagrams showing how to build radio telephone transmitting sets is incorporated in this catalog. Besides this there is the complete Remler, Chelsea, Firth, Westinghouse, Murdock catalogs, and countless other products including all our own goods.

Send 12c. for this catalog today. You can spend many times this amount for a dozen different catalogs without equaling the veritable treasure house of radio goods and information in this catalog.

## THE WILLIAM B. DUCK COMPANY

243-245 Superior Street,

Toledo, Ohio

## Nola Radio Company

Radio Magnavox—Special .....	\$42.50
Amrad Mounted Amplifying Transformer..	4.50
Amrad Unmounted Amplifying Transformer..	3.75
DeForest A400 Mtd. Amplifying Transformer	7.00
Acme Unmounted Amplifying Transformer	4.50
Rhamatine Mounted Amplifying Transformer	3.50
Federal Mounted Amplifying Transformer..	7.00
Radio Corp. Mtd. Amplifying Transformer	7.00
Saco Clad Transformer .....	5.00
Amplifying Coil Units (Pri. and Sec.) 1½x	
1½x¾ Core .....	2.75

### Crescent Radio Storage Batteries

*Guaranteed eighteen months.*

F.O.B. New Orleans

6V 40 Amp. H. \$16.00	6V 60 Amp. H. \$19.00
6V 80 Amp. H. \$24.00.	Larger sizes upon application

*All standard Radio Apparatus and Parts in stock.*

Baldwin "C" phones now .....	\$13.75
Baldwin "E" phones now .....	15.00
Baldwin "F" phones now .....	16.25
Brown, Unadjusted .....	16.00
Brown, Adjusted .....	18.00
Liberty 2,200 Ohms .....	8.00

Literature Upon Request

## NOLA RADIO COMPANY

134 Chartres St., New Orleans, La.

## Magnet Wire

¼ lb. Spools-Silk

#22 S. S. C. (Tinned)	\$0.20 ea.
#24 S. S. C. ....	.25 ea.
#28 S. S. C. ....	.25 ea.
#30 S. S. C. ....	.25 ea.
#32 S. S. C. ....	.25 ea.
#34 S. S. C. ....	.25 ea.
#36 S. S. C. ....	.25 ea.

½ lb. Coils

#26 S. S. C. (Tinned)	.40
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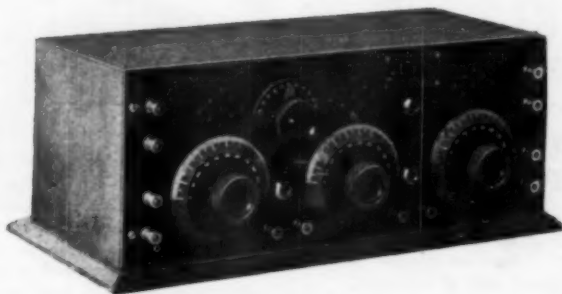
One pound spools of all sizes and insulations always on hand at lowest prices.

## PIONEER ELECTRIC CO.

137 E 5th. Street,  
ST. PAUL, MINN.



# Announcing Columbia Radio Company's Detector and Two-Step Amplifier



*Price \$55.00*

## SPECIFICATIONS

**Dimensions:** 6"x7½"x16"

**Woodwork:** Base and Ends, black oak

**Panel:** Grained Formica

**Back and Top:** Polished Formica

**Jacks:** Automatic filament control on Det., 1st. and 2nd step, lighting tube as step is plugged

**Transformers:** Especially designed for the present day tubes

**Grid Potential:** Grid potential supplied on both Det. and Amp. tubes.

**Detector Control:** Potentiometer (low resistance) for close adjustment

**Connections:** Binding posts arranged for use of same or separate "A" battery, and same or separate "B" battery on Det. and Amp.

**Metal Parts:** Polished nickle plate

Less tubes and batteries

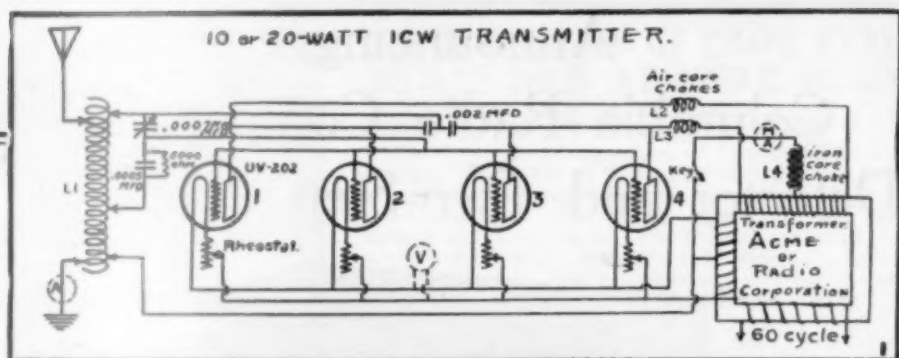
Include postage—Write for literature

## COLUMBIA RADIO COMPANY

South Ave. at Indianola

YOUNGSTOWN,

OHIO



### SEND FOR BULLETINS AND NEW PRICES

The above diagram is one of many illustrated and completely described in our latest bulletin on "CW" and "ICW." Sent on receipt of 4 cents to cover postage and cost of mailing.

Buy your apparatus and equipment of us. We allow 5 per cent. discount on orders of \$10.00 or more and pay postage on shipments in 1st and 2nd zone. Write today for the Bulletin and New Prices.

**PEORIA RADIO SALES CO.**

Dept. A., Peoria, Ill.

### DEALERS: Send for Our Trade Schedule

Keep posted on new prices and equipment. Owing to our connection with the largest manufacturers, some of whom we represent exclusively, we are prepared to offer dealers a real advantage in price and delivery. If you are a Dealer, write at once for our new trade schedules. Get your name on our mailing list for latest information on prices and equipment.

**KLAUS RADIO COMPANY**

Dept. 100, Eureka, Ill.



**New Catalog E6 FREE**  
Just off the press

Contains up-to-date, comprehensive description of America's best Radio Apparatus. This is THE Catalog to select from. Lists only the most approved instruments—the biggest values of 51 makers. 84 pages. Free on request.

Two Famous N-S Specialties  
Red-Head Radio phones,  
3000 ohms, military head  
band with cord ..... **\$8.00**  
complete .....  
Arlington-Tested Cry-  
stals: Galena or Silicon.  
Certified super-  
sensitive ..... **25c.**  
per crystal

**24-HOUR  
SERVICE  
WE PAY ALL  
SHIPPING  
CHARGES**

**THE NEWMAN-STERN CO.**  
Newman-Stern Bldg., Cleveland, Ohio

Radio Amateurs of COLORADO,  
UTAH, NEBRASKA and WYO-  
MING DO YOU KNOW

**DENVER**  
HAS THE LARGEST WIRELESS  
SUPPLY STORE in the MIDDLE  
WEST

A complete stock of all standard Radio  
Supplies, from which we make  
**IMMEDIATE DELIVERY**

**Special DeForest Radiophones**

Start with the "interpanel" system and  
thus avoid discarding apparatus.  
Write for our Bulletins and Price List.  
We will give prompt Mail Order Service  
by Parcel Post or Express, as requested.  
Our "REYNRAD" Short-wave Coils are  
best on the market—\$2 each.

**REYNOLDS RADIO CO., Inc.**  
613 19th St., DENVER, COL.

### NOTICE! 4th DISTRICT AMATEURS! NOTICE!

We announce the opening of Southern Radio Supply Co.

Better service for the Southern Amateur.—A complete line of spark & CW apparatus—Federal, Acme, Remler, Murdock, Clapp-Eastham, DeForest and Amrad apparatus. Formica sheets and tubes cut to any size—RAC 3 Audions \$3.50; receptacles \$1.00 postpaid.—Cunningham detectors, amplifiers & Power tubes.—Detector control panel complete with tube and base \$10.00. Postpaid.

**Southern Radio Supply Co.,** North Ft. Harrison Ave., Clearwater, Fla.

## INSIST UPON Somerville CW Condensers

.00025, .0005, .001, .002 mfd.

They REALLY DO stand up under 1000 volts—and they cost but

**75c.**

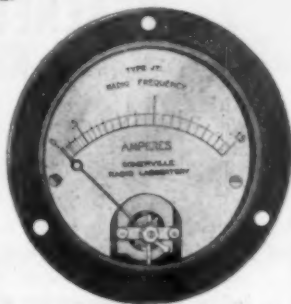
Postpaid—Direct or  
From Your Dealer

2000 volt tested.

**KNOW THE  
TRUTH  
USE A  
TYPE JT**

**THERMO-  
JUNCTION  
RADIATION  
AMMETER**  
0-1½, 0-3  
0-5, 1-0

**AMPERE  
RANGES  
\$12 POSTAGE  
PAID**



Diameter 3¼" jewel bearing not affected by temperature changes.

Type JX 0-15 Voltmeter, A.C. Flush. \$8.

Type JX 0-10 Ammeter, A.C. Flush. 8.

Type J Milliammeter, D.C. Flush... 6.

0-50, 0-100, 0-300, 0-500, 0-1500 M.A. Ranges.

Type J. 0-10 Voltmeter, D.C. Flush.

This meter is coming into daily use with receiving tubes—to maintain the filament at constant voltage.

Type J. D.C. Voltmeter—with external resistances, 0-100, \$8; 0-500, \$15; 0-1000, \$22.

### GUARANTEE

Each meter is guaranteed against mechanical and electrical defects for one year, and will be repaired at cost if damaged by misuse.

### Somerville Jr. Condensers

Similar to our CW condensers but use a thinner dielectric and are not tested. Copper lug terminals available in .00025, .0005, and .001 mfd., capacities. 25c p.p. .00025 and .0005 mfd. with grid leaks 15c extra.

### VARIOMETERS

REMLER, moulded Bakelite, no dial, ¼" shaft .....\$6.00  
AMRAD, wavy-wound type, no dial, ⅜" shaft ..... 6.10

### VARIOCOUPLERS

REMLER, moulded, 180 coupling, no dial, ¼" shaft .....\$5.40  
AMRAD, wavy-wound type, no dial, ⅜" shaft .....\$6.90

## SOMERVILLE RADIO

LABORATORY

Sales Office: 178 Washington St.,

BOSTON, MASS.

## Somerville Radio Guaranteed Stock

### AMPLIFYING TRANSFORMERS

UV 712 Radio Corporation.....\$7.00  
General Radio, new type..... 5.00  
Chelsea, just out, mounted..... 4.50

### AMPLIFIER CABINETS

2 stage GREBE, with fl. control....\$55.00  
Detector & 2 stage AMRAD, just out 47.50

### TUNER CABINETS

GREBE CR-5, 150-3000 m. new type.\$80.00  
GREBE CR-8, 150-1000 m. new type. 80.00  
GREBE CR-9, 150-3000 m. new type.130.00  
AMRAD 2596 170-360 m. new type. 45.00

### HEAD TELEPHONES

BROWN—Imported, adjustable....\$18.00  
BROWN—Imported, non-adjustable. 16.00  
WESTERN ELECTRIC, 2200 ohm  
\$15.00 value, special..... 12.00  
MURDOCK #56, with Navy type  
headband, 2000 ohm..... 5.00

### LOUD SPEAKERS

MAGNAVOX, 5 watt, new type, 1  
amp. field.....\$45.00  
BALDWIN Type C unit, no cord,  
new price..... 7.00

### "B" BATTERIES

SORSINC 22½ volt, 6400 mil. amp.  
hr. life.....\$4.00  
EVEREADY #766 22½ volt, with  
taps, large..... 3.00  
EVEREADY #703 unit type, 22½  
volt ..... 1.75

### VACUUM TUBES

RADIOTRON UV 200, P.P., insured.\$5.00  
RADIOTRON UV 201, P.P., insured. 6.50  
RADIOTRON UV 202, P.P., insured. 8.00  
RADIOTRON UV 203, P.P., insured.30.00

### VT SOCKETS

SORALA S10, with bakelite base....\$1.00  
DeForest, all Bakelite, moulded.... 1.25  
RADIO CORP. UT 541 for UV 203's. 2.50  
RADIO CORP. 5000 Ohm Grid Lead  
for UV 202..... 1.10

### TUBE RHEOSTATS

MURDOCK, bakelite base, revers-  
ible, 6 ohm.....\$1.00  
FADA, Thermoplas base, smooth  
running ..... 1.25  
SOMERVILLE, 6 ampere, Shramco  
unit ..... 2.75

### POTENTIOMETER

For Plate Voltage Control  
RADIO CORP. "A" bat. type, 200 ohm \$2.00

### FEDERAL JACKS

1421 Open circuit.....\$0.70  
1422 closed circuit..... .85  
1423 double circuit..... 1.00  
1435 auto. filament control, closed... 1.20  
1438 auto. filament control, double... 1.50

### PLUGS FOR JACKS

47 A WESTERN ELECTRIC, nickel  
plated .....\$1.35  
FIRCO, bull-dog grip, flat..... 2.00  
FIRCO, bull-dog grip, round..... 2.50



**KENNEDY  
EQUIPMENT**

Our new improved  
Type 281

## SHORT-WAVE REGENERATIVE RECEIVER

Licensed under Armstrong U. S. Pat. No. 1,113,149  
meters. The ideal set for relay work. It embodies all the features of correct design

and superior workmanship that have established the reputation of Kennedy Equipment.

You will be interested in the details of this new short wave set. Ask your dealer about it. If he cannot supply you we will send you Bulletin 201 on request.

The high quality of Kennedy apparatus is being appreciated by those who want the best results. We again find it necessary to greatly increase our factory capacity to meet the demand.

# THE COLIN B. KENNEDY COMPANY

RIALTO BUILDING

INCORPORATED

SAN FRANCISCO

## Wireless Amateurs Attention!

If you want service, order from us. We carry a large stock of High Grade Wireless Apparatus of our own and other manufacturers.

### SPECIAL!

Vacuum Tube Sockets.....	\$1.25
Rheostats .....	1.25
22½ Volt "B" Batteries.....	1.50
Rasco Dials .....	.60
Rubber Binding Posts.....	.20
Tested Galena.....	.40
Lateral Wound Coils. All Sizes.	

Send 5c for our large illustrated catalog.

**J. M. PAQUIN,**  
THE ELECTRICAL SHOP,  
787 Queen St. West, Toronto, Ont.



## RADIO CLUB PINS

Radio Clubs Everywhere have a special club pin. We make them to order, 25c to \$10.00 each. 1922 catalog of 48 pages showing designs of Radio, School and fraternal pins and rings FREE. Samples loaned to officers.

**Metal Arts Co., Inc.** 7753 SOUTH AVE.,  
ROCHESTER, N.Y.

## QST! At Last!! QST!

A guaranteed 6 Volt 60-80 Ampere hour Storage Battery. Will not sulphate. Price, each .....\$12.35

BRECO Wireless Telephone Equipment

- 1—A 20 Watt Wireless Telephone and C.W. panel transmitter. Constructed with the best apparatus manufactured. Wave length 200 to 475 meters. Range 50 to 250 miles. Price .....\$130
  - 2—A 5 Watt C.W. and phone panel transmitter. A neat, well constructed instrument. Can be used for C.W., I.C.W., and phone. Wave Length 200 to 475 meters. Range 5 to 20 miles. Price ..\$50
  - 3—A 75 Watt Rectifier panel which uses 110 A.C. rectifies into 550 D.C. Absolutely no hum. It also contains two filament windings for the power tubes. Price .....\$130
  - 4—Detector and two stage amplifier. A very efficient set. Constructed with the highest grade apparatus manufactured. Price .....\$65
  - 5—Two stage amplifier. A well designed panel built to meet the rigid inspection of the user. Audibility amplification 400 times. Price .....\$45
  - 6—A Short wave tuner. A neatly designed panel containing only the highest grade apparatus. Wave length 150 to 600 meters. Price .....\$45
  - 7—Combination long and short wave panel designed to meet the requirements of advanced amateurs. Will take in all European and amateur stations. Wave length 250 to 25000 meters. Price ...\$125
- Estimates furnished on receiving, transmitting and phone sets built to your own specifications.

**Bronx Radio Equipment Co.**

667 Courtlandt Avenue,

Bronx, N. Y. C.

## \$5 AUDION PANELS \$5

Panel's lettered, has Grid Leak and Cond. Dial, Posts for Tickler, etc. Send 3c in stamps for enlarged lists and data.

50c—FOR AUDION BULBS—50c

"ARK" RADIO SUPPLY

97 Hill St.,

Shelton, Conn.

Q





## FADA POWER-TUBE RHEOSTATS

are made the same as the receiving tube rheostat (6 ohms,  $1\frac{1}{2}$  ampere) except that Nichrome wire is used, giving a resistance of  $1\frac{1}{2}$  ohms and a current carrying capacity of 5 amperes—sufficient for two 5 watt Radio-tron power tubes. The base and knob are made of heat resisting Thermo-plax. Base is only  $2\frac{1}{8}$ " in diameter. The price is only

**\$1.35**

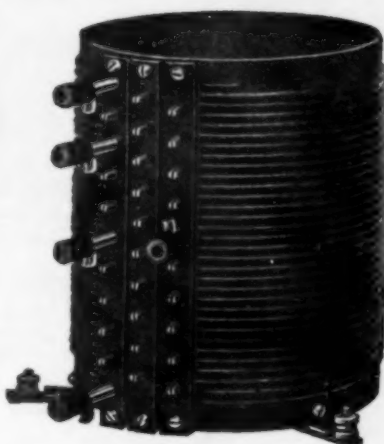
**FRANK A. D. ANDREA**

Manufacturer of FADA Radio Products  
1882-B Jerome Ave., New York City



# A C M E

## C.W. INDUCTANCE



### Specifications

5" Formica Tube. 30 Turns heavy copper wire. Tapped each turn in the form of slotted studs. Tubular insulated terminals of proper size to fit studs. A Grid Coil is also available and easily adapted to this inductance.

**Type L-1 C.W. Inductance \$8**

**Type G-1 Grid Coil . . . . \$2**

\* \* \* \* \*

C.W. Power Transformers  
Filament Heating Transformers  
Modulation Transformers  
Amplifying Transformers  
Choke Coils  
Amplifier, Detector  
Spark Transformers  
Special Transformers

*Write for bulletins of the most complete line of C.W. Apparatus.*

**ACME APPARATUS CO.**

194 Massachusetts Avenue  
Cambridge 39, Mass.

*Transformer and Radio Engineers and  
Manufacturers*

New York Sales Office 1270 Broadway

J. C. Smith

## TUSCOLA RADIO SUPPLY STATION

(EAST STONE BUILDING)

TUSCOLA, ILL.

Sept., 10, 1931.

RAT-DI-CO.,  
2655 N. Clark St.,  
Chicago Illinois.

Gentlemen:

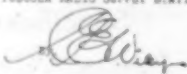
We take pleasure in advising you of the exceptional performance of one of your Midget Motor Generators. We are using a three tube radio-telephone transmitter using five Watt tubes and draw our plate supply from the above generator. Our radiation when the A. C. voltage at the motor terminals is 110 V. runs from .90 to .95 Amps.

Twice each week we broadcast phonograph music, and in each case the unit is run for one hour without a stop. This is done without excessive heating of the machine. Recently while furnishing radio-telephone music for a phone in a nearby town, we ran the generator for a continuous period of three hours and one half.

We will be very glad indeed, to answer questions regarding the machine if we have not made it clear that we hold a high regard for your product.

Very truly yours,

TUSCOLA RADIO SUPPLY STATION.



C. S. Smith

# MIDGET

"Hylo" "Standard"

6 and 32 Volt "Dynamotors"

Complete line of standard apparatus. Order from your catalog of any manufacturer.

## The Ray-Di-Co Organization

(Ray-Dee-Ko)

Radio 9AG

1547D N. Wells Chicago

## WEST COAST RADIO MEN LISTEN!

WHY SEND EAST FOR YOUR APPARATUS and SUPPLIES. WE have Good NEW and USED EQUIPMENT. Give US a TRIAL. Send for our new list.

WE BUY ONLY STANDARD APPARATUS.

CALL RADIO 6ABG.

METEOR ELECTRIC CO

309 So. Flower St., Los Angeles, Calif.

Order your Radio supplies from nearest DELFELCO agent or write direct.

"DELFELCO SERVICE"

DELANCEY FELCH & CO.

12 Meeting Street

PAWTUCKET, R. I.

## NEW MOTORS

FOR ALL PURPOSES  
STANDARD MANUFACTURERS  
PROMPT DELIVERY

ALL SIZES UP TO 5 H.P.

We Specialize In Small Motors & Generators

ALL PHASES AND FREQUENCIES IN STOCK AT ALL TIMES

Largest exclusive Mail Order Small Motordealers in the world.

CHAS. N. JOHNSTON, Box 19, West End, Pittsburgh, Pa.

WIRELESS, TELEPHONE GENERATORS

500 VOLT - 100 WATT - 3400 R.P.M.

FOR MOUNTING MOTOR GENERATOR SETS.

\$28.50  
EACH

WRITE FOR  
CATALOG



## For Sale 9HM

We are installing a 1 KW. 500 cycle set and have for sale the following:

### TRANSMITTER:

1KW Unted Wireless "Coffin" 30,000 volt sec Arrow Synchronous gap. 1/2 inch plate glass condenser. Brass sheet conductors. Iron tank—20 gal. of oil. Cap. about .02 mf. Heavy O.T. This set has been heard in EVERY state in the Union. Price \$200.00.

### RECEIVER:

Paragon type regenerative set. Has serial and phone condensers on panel. Built by an instrument maker. Range 190-500 meters. Price \$25.00. Detector and 2-step to match. Price \$35.00. Send for foto if interested.

Send for List of other apparatus

Twin City Radio Lab.

1655 Wesley Ave. 9HM St. Paul, Minn.

# In Stock For Immediate Shipment

A Complete Line of Worth While Radio Apparatus

## AMPLIFYING TRANSFORMERS

A-2 Acme Mounted .....	\$5.00
226 Federal .....	7.00
41 Jefferson .....	5.00
45 Jefferson .....	7.50

## "B" BATTERIES

763 Eveready .....	\$2.25
766 Eveready Tapped .....	3.00

## VACUUM TUBES

UV-200 Radiotron Detector .....	\$5.00
UV-201 Radiotron Amplifier .....	6.50
UV-202 Radiotron 5 Watt Transmitter .....	8.00
UV-203 Radiotron 50 Watt Transmitter .....	30.00

## SOCKETS

550 Murdock .....	\$1.00
R-300 DeForest .....	1.50
R.C. Marconi .....	1.50
203A for 203 Radiotron .....	2.50

## HOT WIRE METERS

127 General Radio 0-1, 0-3, 0-5 amps .....	\$7.75
25 Jewel 0-10 amps. ....	15.00

## AMPLIFIERS

RORE Grebe 1 Stage .....	\$25.00
RORJ Grebe 2 Stage .....	50.00
RORD Grebe Detector & 2 Stage .....	75.00
DA Westinghouse 2 Stage and Detector .....	65.00

## AUDION PANELS

RORA Grebe .....	\$9.00
RORH Grebe .....	17.00
Y-1 Acme .....	10.00
ZRD Clapp-Eastham .....	12.00
401 DeForest .....	14.00
Stranded Copper Aerial Wire per C. Ft. ....	.75

## REGENERATIVE RECEIVERS

CR-3A Grebe 175-375M. ....	\$45.00
CR-3 Grebe 175-68CM. ....	65.00
CR-5 Grebe 150-3000M .....	80.00
CR-8 Grebe Latest Out .....	80.00
CR-6 Grebe 150-680M. ....	200.00
RA Westinghouse .....	65.00

## PLUGS AND JACKS

Patent Universal Plug .....	\$2.00
1428W Federal Plug .....	2.00
1423W Jack Closed Circuit .....	1.00
1435W Jack (Automatic) .....	1.20
1438W Jack (2 Filament control) .....	1.50

## RECEIVERS

56 Murdock 2000 ohm .....	\$5.00
56 Murdock 3000 ohm .....	6.00
Brandes Superior .....	8.00
C Baldwins .....	13.75
E Baldwins .....	15.00
F Baldwins .....	16.25

## VARIABLE CONDENSERS

367 Murdock .0005 Mfd .....	\$3.75
3660 Murdock .001 Mfd .....	4.00
3680 Murdock .0005 Mfd .....	3.25
800 Clapp-Eastham .....	7.50
800A Clapp-Eastham .....	9.50

## TRANSMITTING CONDENSERS

D-100 250W 10000 Volts .007 ..	\$19.00
D-101 500W 14000 Volts .007 ..	30.00
D-102 1000W 21000 Volts .007 ..	45.00
D-103 1000W 25000 Volts .007 ..	50.00
D-113 1000W 25000 Volts .01 ..	55.00

## LOOSE COUPLERS

344 Murdock .....	\$9.00
F673 Clapp-Eastham .....	14.00

If you require something not listed in this advertisement,  
write us, and if it is a standard item we have it!

## ORDER FROM THE ABOVE LIST

Our Large Stock Insures You of the Very Best Service

# MISSOURI RADIO SUPPLY COMPANY

4623 Maryland Ave.,

St. Louis, Mo.

Please include sufficient Postage with mail orders.

# Important Announcement



Due to large quantity production we are enabled to greatly reduce the price of our Storage B Battery. Can you longer afford to be without one?

## NO ACID REQUIRED

Battery is shipped ready for use except that a small amount of distilled water must be added.

## ATTRACTIVE APPEARANCE

22 volt unit in heavy glass jar 4 inches diam.

## LIFE AND PERFORMANCE

It will outlast several dry batteries and its performance is a real satisfaction. EASILY CHARGED from a.c. lighting circuit using the McTighe or other rectifier.

## SATISFACTION GUARANTEED

<b>BATTERY COMPLETE</b> .....	<b>\$3.50</b>
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Postage and packing 20c extra

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Expert Radio Service rendered in the Design of Instruments or Complete Sets, and Installations for the Amateur.

We can furnish parts we design.

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A high-grade line of Radio Supplies and Equipment for the discriminating buyer.

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## Ace "B" Batteries

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We Are Carrying a Full Line of Standard Radio Apparatus. All Orders Shipped Same Day Received. Postage Prepaid and Insured

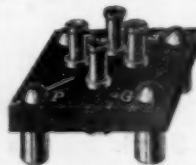
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SPECIAL OFFER: Short Wave Regenerative Receiver Parts; including two completely assembled Variometers (Mahogany forms), 1 assembled variocoupler, one Formica panel 7x7x18". All for \$15.00, postpaid and insured, anywhere in U.S.A. Money back guarantee.

NOTE: With every order received before Dec. 1, we will include, absolutely free, a copy of latest C-W Instruction Book and catalogue. Send for bulletins, a postcard will do.

"UNEXCELLED" SERVICE—Our Motto.  
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This is the new and improved type. FUSED on each filament lead and plate with the new style mica fuse. You can't

**"PUT OUT THAT LIGHT"**

Approximate contact surface between tube prongs and pins 1/4" by 3/8". Positive contact always. Yours by mail P. P. \$1.00. Pins only 10 cents each. Extra fuses 10 cents.

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ALL THE RADIO NEWS  
WHILE IT'S NEW

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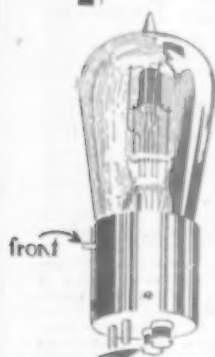
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Your last vacuum tube would still be "alive" and the money you paid for a new one would be in your pocket if its filament had been protected with a

### RADECO SAFETY FUSE

(Patent Pending)

Because of the insignificant cost, and absolute protection against excessive amperage, RADECO Safety Fuses are now a standard part of every efficient wireless set.

NOW, while your tube is in perfect condition, pin one dollar to this advertisement and be guarded against all future vacuum tube expense.

We carry a complete stock of all radio apparatus. Order from any standard catalog.

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RADECO Safety Fuses come in  $\frac{1}{4}$ , 1,  $1\frac{1}{4}$ ,  $1\frac{1}{2}$ , 2,  $2\frac{1}{2}$ , and 3 amp. sizes.

Gentlemen: Kindly send me.....

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We carry in stock a complete line of

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OUR REGENERATIVE RECEIVERS  
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We carry in stock at all times the highest grade magnet wire and can quote the following prices:

PER  $\frac{1}{4}$  LB. SPOOL

Size	Single Cotton	Double Cotton
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No. 20	.25	.27
No. 22	.29	.31
No. 24	.30	.33
No. 26	.33	.38
No. 28	.37	.41
No. 30	.49	.52
No. 32	.62	.65
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For 1 lb.  $\frac{1}{2}$  lb. and  $\frac{3}{4}$  lb. spools, proportionate prices. These prices are net; include the cost of spool, postage and guaranteed safe delivery.

**Aerial Copper Wire No. 14**

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These Prices Invite Comparison — They Defy Competition.

Type DX-1 Detector and One Step \$23.00  
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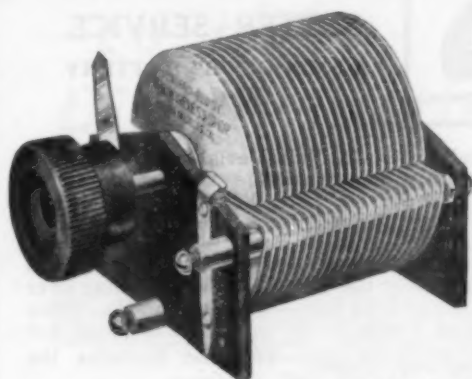
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Radio 9AIK

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Put "Wireless Shop Variables" in your set and end your condenser troubles. They are made right and will stay right. Heavy aluminum plates and spacers, accurately die stamped, formica end plates, and ribbon connection to movable element are points of superiority worth considering.

Our prices may not be as low as some, but the price is low considering the superior instrument we give you. Entire satisfaction or your money back. Prices listed below include knob and pointer and mounting screws. Write for Bulletin No. 1 illustrating and describing the complete line of Wireless Shop variable condensers.

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Include postage for one pound to your postal zone, and insurance, with your remittance.



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The socket that takes off its hat to no other make anywhere under any condition.

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The new "Ace" #627-45 Volt Variable "B" Battery is rapidly creating a remarkable reputation as to "Price," Quality, Service and Weight. The special size cell construction guarantees from 50% to 75% longer life than any 2 small size "B" Batteries. 16 Taps, 30 Voltage readings of from 1½ to 45 Volts obtained. Absolutely the best "B" Battery offer ever made. Size 6in.x5in.x2½in.—weight 3¼ lbs. Price \$3.50. Demand "ACE." If your dealer does not carry "Ace," write to us. This list contains the six popular type "ACE" "B" Batteries.

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623	Variable	2½x2x3½	22½	1	5	1.75
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625	Variable	3 x4x6½	22½	5	5	3.00
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626	Variable	3 x8x6½	45	10	6	6.00

Write for Cat. #20

Ace Batteries are silent, moisture proof and absolutely guaranteed.

DEALERS—Get in on this fast selling item.



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**Hawaiian and German Stations  
Read With a Single Bulb.**

Are you satisfied with your receiving set? Would you like to build one that will receive over 6000 miles on a single bulb and quit experimenting? One that will be the equal of any regardless of claims or price? Using the instruments you now have, you will be able to duplicate the long distance records you read about every day.

Get our simple diagram of a complete short and long wave receiver, 175 to 20,000 meters, with which we read Honolulu, California, German, South American, French and English stations, and practically all the high powered foreign and domestic stations, amateurs as far west as New Mexico and numerous telephone and musical concerts come in good.

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"STILL BETTER RADIO SERVICE"

Immediate Delivery on

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You can get it right here, no need to send away.  
U.V. 202 Radiotrons \$8—5000 ohm grid leaks \$1.25—DeForest apparatus: new style rheostats \$1.65—Bakelite sockets \$1.25—.001 V.C. with vernier \$14—Parts for same \$4.75—.0005 V.C. 90° \$5, parts \$3—Knobs and Dials 90c extra.—80A.H. 6V. batteries \$26.

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**Special Radio Apparatus**  
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# —to the Discriminating Radio Man



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In line with TELMACO'S policy of giving better values, we are offering the TR-1 set UNWIRED only. The receiver is completely assembled; lugs are in place on which to solder wires; No. 14 silver finished wire, as well as necessary tubing is furnished.

The CABINET is constructed of quarter sawed oak, stained inside and out, waxed and hand rubbed. PANEL is of grade M  $\frac{1}{2}$  in. Formica,  $6\frac{1}{4}$  in. x  $16\frac{1}{4}$  in., satin grained finish, mounted on special drawer sub-base. Metal parts are nickel plated and oxidized. BINDING POST CONSTRUCTION is of TELMACO special design extending through back of cabinet, thus removing all external wiring from front of panel.

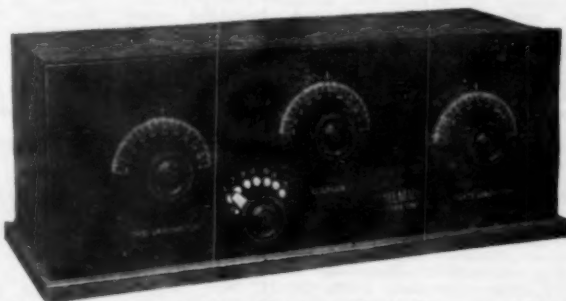
TELMACO VARIOMETERS and VARIO-COUPLER with flush type bearing plates and spring washer bearing contactors are used, thus assuring perfect electrical connections permanently for ball windings without "pigtailings". DIALS are Remier 3 in. polished molded bakelite. LETTERING on panel is pantograph machine engraved, filled with the best grade white enamel.

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Satisfaction guaranteed always or money refunded. Send for our complete, new catalog "T". You'll find it interesting, it describes everything in Radio.

Your panels engraved with our GORTON ENGRAVER. Prices 5 cents per letter. Minimum charge \$2.00

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Send 10c for Bulletin and future announcements  
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**"Quality Receiving Instruments"**  
**APPARATUS GUARANTEED**  
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high tone buzzer, lever type key external tone adjustments, code and instructions.  
\$1.75 Postpaid

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**BARGAINS: \$30 Omnigraph, \$20—Murdock O.T. \$3.00 Weston Ammeter 0-20, \$5.00—Brandes phones, \$4.50—Balanced Clapp-Eastham .0005 Condenser, \$4.50—Stromberg microphone, \$1.00—Everything perfect—W. G. Voss, 312 W. 111 St., New York, N. Y.**

**SALE: 1 KW Transformer, Synchronous Gap, and 500V D.C. Generator.** High class equipment, in perfect condition. **W. T. Gravely, Danville, Va.**

**ATTENTION! AMATEURS!** We give away \$1.00 worth of merchandise in the form of Chelsea dials, Vacuum tube sockets, Condensers or anything that you wish, absolutely free with each purchase of a Radiotron or Cunningham tube at \$5.00 or with any other order of apparatus amounting to \$5.00. Give us a trial. Write for list. **Indianapolis Radio Supply Company, 3023 Boulevard Place, Indianapolis, Ind.**

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**BARGAIN: Complete set, antenna included, \$85. Write George C. Schmid, Neenah, Wis.**

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Three Murdock variables; audion cabinet; new tube; large Eveready B battery; "Transatlantic" phones. Material worth forty dollars. Make an offer. Malcolm MacNaught, Williams Street, Brookline, Mass.

**BARGAINS:** Regenerative, \$75-600, Tuska molded variometers, \$25.00; Control Panel: includes variable grid condenser, potentiometer, \$10.00. Above in cabinets. Large coupler: compound primary switch, 175-3,000, \$15.00. Money order only, John Winthrop Packard, Canton, Mass.

**FOR SALE** 12 fifty volt Edison Storage Batteries for Audion plate voltage Five  $\frac{1}{2}$  KW 500 cycle American Transformers and two CN113A receivers Navy Standard. H. M. Schneider, 432 West 28th. St., Norfolk, Va.

W. E. Aeroplane Microphones, with Breast Plate, Straps, and Cord \$5.00, Bakelite Tubing 5 in. diam. at 6 in. 25c; 8 in. 35c; 12 in. 45c; 3 ft. length \$1.00. Litz Wire, 10-38 35c for 100 ft. 25-32 1c ft. 36-30 2c ft. Larvite Resistance Unit 48000 Ohms 50c. Complete Parts for Short Wave Regenerative Receiver \$18. 2 Circuit Jack with Plug and Cord \$1.10. Other Bargains. Send for Catalog. Haupt Electric Supply Co., 2442 Ogden Ave., Chicago, Ill.

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**BARGAIN:**  $\frac{1}{2}$  KW sending set new \$45, write for description. Philip Schwartz, Washington, Pa.

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**FOR SALE or Exchange** one good typewriter. Trans. and Receiving instruments, all like new, value about \$130. For particulars write Edgar F. Moyer, 561 Broad St., Emaus, Pa.

**SHORT WAVE** Regenerative Receiver, Grebe detector unit Baldwin phones \$50. Have many pairs of phones reasonable. Miller, 33 Windsor Place, Brooklyn, N. Y.

**THAT'S THE BERRIES!** What? Horatio 7 strand pure copper antenna cable \$4.50 per 500, \$8 per 1000 ft. Real Apparatus and Real Service on all makes. Hoopston Radio Shop, Hoopston, Illinois.

**FOR SALE:** Grebe CR2 \$35; R. Warren, 57 Monmouth St., Brookline, Mass.

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**RADIO APPARATUS** made to order. I do repairing, rebuilding and assembling. Special inductances wound to order. Send for estimate. R. Pringle, 1096 Ryde St., St. Paul, Minn.

**LOG BOOKS** and Postal Cards Tell the other fellow how and when you heard him. Your name and call on 100 postals giving information about signals heard and your own equipment, dollar fifty. Eighty page Log Book, special pages, abbreviations, calls, other information, postpaid, dollar. Call and name printed on book cover free if order both. Commercial Press, Everett, Washington.

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**OAK CABINETS** finished dark oak or mahogany. Material and workmanship of the highest quality. Built for the following panels. (6x8x6") \$2.75 (6x14x6") \$3.20. (10x14x8") \$4.10. We pay transportation charges. DX Radio Laboratory, Oak Harbor, Ohio.

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From Manufacturer to User—  
Which assures you of a  
fresh "B" Battery



## Announcing WIZARD'S

- 2 new improved type "B" Batteries.  
No. 1632—1 tap 45 Volt Var. Battery.  
Size 6in.x5in.x2 3/4 in. Price \$2.80 weight  
3 3/4 lbs.  
No. 1630—6 tap 27 Volt Var. Battery.  
Size 6in.x3in.x2 3/4 in. Price \$1.80 weight  
2 1/4 lbs.

These new types are not made of the same size cells as a small size "B" Battery. The volume of one of the cells in these types is 4.7 C.W. inches, as compared with 2.5 C.W. inches, which is the volume of a cell used in small "B"s. So you can see, that the life of these two new types are almost double the life of the small "B"s. No. 1632 has 1 tap at 22 1/2 volts.

These prices seem unbelievable as do all other "WIZARD" prices, but are made possible, only by dealing direct with the consumer.

Thousands are realizing the money that can be saved in the course of a year by purchasing from Wizard. Always remember, we pay P.F. charges.

Write for Wizard Bulletin No. 6.

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Cat. No.	Size	Taps	Voltage	Price
1623 Plain	2 1/2 x 2 x 3 3/4		22 1/2	\$1.00
1623 Variable	2 1/2 x 2 x 3 3/4	5	22 1/2	1.20
1625 Plain	3 x 4 x 6 3/4		22 1/2	1.85
1625 Variable	3 x 4 x 6 3/4	5	22 1/2	2.25
1626 Plain	3 x 8 x 6 3/4		45	3.75
1626 Variable	3 x 8 x 6 3/4	6	45	4.15

SEND ALL MONEY ORDERS TO

**WIZARD BATTERY CO.**

1315-42nd St. Brooklyn, N. Y., Dept. R.

**BARGAIN:** Clapp-Eastham half KW Hytone Transmitter. This set cost \$250, new, but is going cheap, as the owner is hard up for cash. James Mott Hallowell, Jr., Chestnut Hill, Mass.

**SELL:** Station 9ZL complete \$350; 2 KW synchronous transmitter, three stage regenerative receiver. Can't be beat. Guaranteed. Description, Photos, and records upon request. Selling account of transfer to NAA. H. J. Burhop, Room 2629, Navy Department, Washington, D. C.

**GENERATORS FOR SALE:** Crocker Wheeler 500V. 500W. 56 segment with field rheostat \$50; Robbins Myers, 500V. 50W., \$8; 100V. 200W. \$8; 8V. 10 amp. \$8 Jewell D.C. ammeter flush 0-10A, \$6.00. 3HB.

**WANT TO BUY** 1500 volt 150 watt D.C. generator. Must be in good condition. Write K. B. Warner, QST, 1045 Main Street, Hartford, Conn.

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Type TH2

## Oscillation Transformer

This transformer is finding favor in all modern stations. Why not put your station in this class? With the new low price you cannot afford to be without one. It will positively increase your transmitting range.

### ADDED FEATURES

Ribbon fastened securely to the heavy bakelite cross arms. Cannot work loose. Large windings. Each 18" in diameter. Primary on TH1 wound with 1 inch ribbon. Primary on TH2 wound with 3 inch ribbon.

### NEW PRICES

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TH2 ..... 15.00

Most progressive dealers have either style in stock but in case he cannot supply you, order direct from factory and give us your dealers name.

**T & H RADIO COMPANY**  
**ANTHONY, KANSAS**

## Everything for the Amateur

Small Storage Batteries for Audions  
Cells—any size, from pocket flashlight battery cell up.

Ask for circular.

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**GALVESTON, TEXAS**

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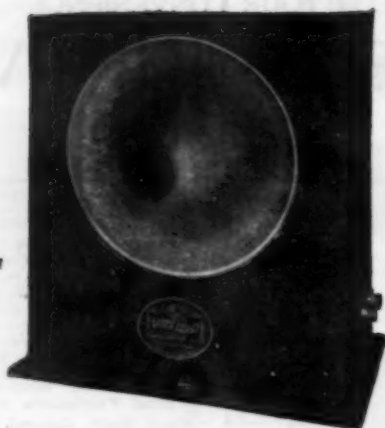
## IN THIS ISSUE

Ace Battery Mfg. Corp.	130	Laughter, V. H.	126
Acme Apparatus Co.	123	Linze Electrical Supply Co.	94
Adams-Morgan Co.	86	Magnavox Co., The	117
Ajax Electric Co.	131	Manhattan Elec'l Supply Co., Inc.	66
Alamo Radio Elec. Co., The	88	Marshall-Gerken Co., The	99
All-American Electrical Mfrs.	78	Massachusetts Radio & Tel. School	92
American Radio & Research Corp.	Fourth Cover	McTighe Battery Co.	126
American Radio Sales & Service Co., The	116	Metal Arts Co., Inc.	122
Andrea, Frank A. D.	123	Meteor Electric Co.	134
Apex Radio Shop	84	Meyberg Co., Leo J.	83
"Ark" Radio Supply	122	Missouri Radio Supply Co.	125
Atlantic Radio Co.	Second Cover	Murdock Co., Wm. J.	91
Atlantic-Pacific Radio Supplies Co.	2	Mutual Purchasers Assn.	110
Benwood Co., Inc., The	82	Navy Dept. Central Sales Office	109
Bowman & Co., A. W.	108	New England Radio Engineering Co.	126
Brandes, C., Inc.	66	Newman-Stern Co.	120
Bronx Radio Equipment Co.	122	Nola Radio Co.	118
Bunnell & Co., J. H.	129	Oklahoma Radio Shop	128
Burgess Battery Co.	80	Pacent Electric Co., Inc.	75
California Electric Supply Co.	115	Paquin, J. M.	122
Carter Electric Co.	104	Paragon Electric Co.	131
Chelsea Radio Co.	70	Parkin Mfg. Co.	96
Chicago Radio Apparatus Co.	69	Philadelphia School of Wireless Tel.	89
Chicago Radio Laboratory	81	Peoria Radio Sales Co.	120
Cino Radio Mfg. Co.	114	Pioneer Electric Co.	118
Citizen Radio Supply Co.	126	Pitts Co., F. D.	4
Clapp-Eastham Co.	95	Precision Equipment Co., The	98
Clark, C. B. & Son	129	Radio	127
Columbia Radio Co.	119	Radio Audion Co.	1
Columbus Radio Apparatus Co.	82	Radio Construction Co.	134
Condensite Co. of America	85	Radio Corporation of America	97
Connecticut Tel. & Elec. Co.	130	Radio Electric Co.	104
Continental Radio & Elec. Corp.	Third Cover	Radio Equipment Co., Boston	128
Corwin & Co., A. H.	68-136	Radio Instrument Co.	108
Coto-Coil Co.	78	Radioelectric Shop	112
Cox Manufacturing Co.	96	Radio Panel Shop	131
Craig and Loughborough	108	Radio Testing Station	112
Crosley Mfg. Co.	77	Ray-Di-Co.	124
DX Radio Co.	128	Remler Radio Mfg. Co.	3
DeForest Radio Tel. & Tel. Co.	64-65	Reynolds Radio Co., Inc.	120
Delaney, Felch & Co.	124	Rhamstine, J. Thos.	84
Devon Electric Co., Inc.	68	Rose Radio Supply	76
Diamond State Fibre Co.	98	Sayre-Level Radio Co.	106
Doron Bros. Electrical Co.	72	Scheib Electric Radio Co.	129
Doubleday-Hill Electric Co.	74	Scientific Experimenter, Ltd.	92
Dreyfuss Sales Corp.	128	Ship Owners Radio Service, Inc.	87
Duck Co., The Wm. B.	118	Shotton Radio Mfg. Co., The	80
Eastern Ohio Radio Mfg. Co.	102	Signal Electric Mfg. Co.	101
Eastern Radio Institute	73	Simplex Radio Co.	92
Eby Mfg. Co., The H. H.	100	Somerville Radio Laboratory	121
Electric Motor & Engineering Co.	110	Southern Radio Supply Co.	120
Electric Specialty Co.	86	Standard Assembling Co.	72
Electrical Specialty Co.	107	Standard Radio Co.	82
Empyrean Radio Co.	130	Stockwell, P. J.	70
European Radio Co.	100	Supremus Radio Laboratory	80
Experimenters Information Service	103	T. & H. Radio Co.	134
Federal Tel. & Tel. Co.	104	Teeter, W. L.	131
Firth & Co., John	63	Telephone Maintenance Co.	131
Formica Insulation Co., The	117	Thordarson Electric Mfg. Co.	67-94
France Mfg. Co., The	90	Tresco	84
Galveston Wireless Supply Co.	134	Tuska Co., The C. D.	90
General Radio Co.	93	Twin City Radio Laboratory	124
Grebe & Co., A. H.	79	U of I Supply Store	88
Hygrade Electric Novelty Co.	116	Virginia Novelty Co.	130
Ideal Apparatus Co.	111	Western Radio Electric Co.	76
Illinois Radio Appliance Co.	96	Westinghouse Elec. & Mfg. Co.	105
Independent Radio Supply Co.	106	Weston Elec'l Instrument Co.	102
Jewell Electrical Instrument Co.	98	Whitall Electric Co.	113
Joy & Kelsey	110	Winkler, Frederick Jr.	116
Johnston, Charles H.	124	Wilcox Laboratories, Inc., The	88
Karlows Radio Corp., The	74	Wireless Equipment Co.	102
Kelly & Phillips	90	Wireless Mfg. Co.	71
Kennedy Co., The Colin B.	122	Wireless Press, Inc.	112
Keystone Wire Co.	114	Wireless Shop, The	129
Kimley Electric Co.	114	Wizard Battery Co.	134
Klaus Radio Co.	120	Wolfe Electric Co.	94
Kuebler Radio Co., The	108	Y. M. C. A. Radio School	100
Kraus Battery Co.	130	Zamoiski Co., Jos. M.	106
Laing, A. K. Radio Co.	126		

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(In handsome mahogany cabinet as shown.)

**\$30.00**



**Laboratory Type**  
(Mounted on metal base, adjustable height.)

**\$25.00**

**THE**

# VOCALoud

**T**HE IDEAL loud-speaker. Requires no batteries, no adjustments, no extra equipment whatever! Just hook VOCALoud right on to your receiving apparatus and

listen to your signals,—QSA all over your house! Uses genuine Baldwin reproducer,—equally good for telephone and telegraph. Your order shipped at once!

## CORWIN'S improved SWITCH LEVER

Sure contacts, smooth operation, handsome appearance,—all are characteristics of this improved switch. Many switches give their manufacturers more profit,—none give their users more satisfaction. Try a Corwin Switch. As good as it looks!



**PRICE:**  
**90 cents**  
**Postage,**  
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Composition knob, identical with knobs, used on standard #67 Corwin Dial. Brass shaft is moulded right into knob,—it can never come loose. Blade, bushings, etc. nickel-plated brass. Contact radius, 1 1/4".

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For Radisco and all hand wound coils. No bending, no filing, they fit exactly in the first place.

**80 cents, postpaid**

All orders for apparatus not listed as postpaid must be accompanied by postage charges.

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**CORWIN'S  
1921  
CATALOG  
10c**

*Send for your copy today!*

## NEW RADISCO VARIO-COUPLER

"Accurate to the .002 part of an inch. Moulded base, Formica tube, all metal parts brass.

**\$7.50 postpaid**

Remember Corwin's reputation for shipping mail orders promptly and in perfect condition.

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# CONTINENTAL NEWS

November, 1921

Published occasionally in QST by Continental Radio and Electric Corporation

## *All the way from Honolulu*

they send to Continental for radio supplies. Read this letter, recently received:

"Today I am sending you a radio again for some wire-less supplies. You are getting me delivery in fifteen days from the day I cable you, which is some service to the center of the Pacific."

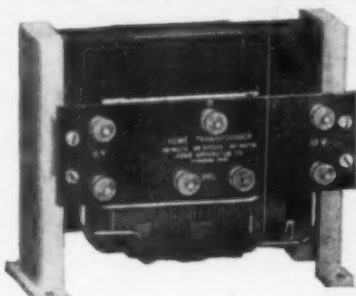
(Signed) Cyril O. Smith.

Permanent address: The Royal School, Honolulu.

From Honolulu to New York, and back, in fifteen days! That means we shipped the order the day we got it. It means we had the goods right on hand, ready to be shipped at once. And we must have shipped it well, or Mr. Smith wouldn't keep on sending to us for all the radio supplies.

Are you getting that kind of attention to your mail orders? Try Continental the next time you need radio supplies. Our service covers the world. No matter where you live, you can count on the same courtesy by mail, that you would receive in the store itself. No excuses, we make good!

There are still a few copies left of the Grebe 112-page catalogue. Send a quarter for your copy, which will be credited to your first \$5.00 order. In the meantime, look over this list of specials, and order direct from the ad. Please help us to avoid any delay whatever, by making remittance by P.O. Money Order or bank draft.



## Acme C. W. Power Transformers

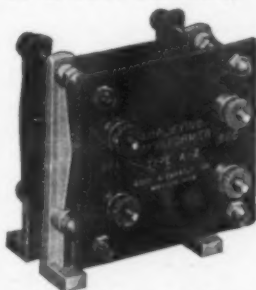
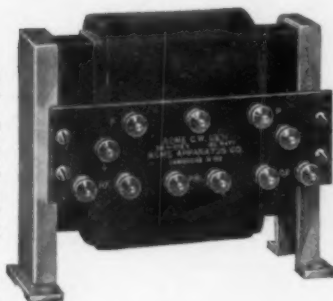
Acme transformers used with the proper choke coils and condensers, provide a highly satisfactory source of high voltage D.C. from any 110 volt supply.

200 watt, mounted, \$20.00  
50 watt, mounted, 15.00

## Acme Filament Heating Transformers

Developed to operate on 110 volts, and to deliver two secondary voltages to care for tubes requiring different voltages for proper operation. Will supply rated load continuously without undue overheating.

8 & 10V. 75 watt, \$12.00  
10 & 12V. 150 watt, 16.00



## Acme Modulation Transformers

Primary and secondary impedances are of the correct value for most efficient results.

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By using this set, you will always have the microphone in proper position, by reason of the novel shape and the position of the mouthpiece. Black corrugated handle, horn mouthpiece, metal parts heavily nicked.

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Phonotron & PARAGON R.A. TEN.

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*The Recognized Symbol of Superior Performance*



Dimensions 10x5x5 in.  
Price \$30.00

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(Type F)

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The TUNER is ready to operate when connected up with two .001 mfd. Variable Condensers, and one VT Detector, preferably the Amrad types described in Bulletin V. With every Tuner we enclose a blueprint giving the key to the various wavelength combinations.

## For the Operator Who Makes His Own

	Bulletin	Price
Knob & Dial, flat type, 180° or 90° scale..	R	\$0.50
Knob & Dial, beveled type, 100 or 50 scale..	N	.65
Fixed Condenser, cartridge type, 4 capacities	N	.45
Grid Leak, five values, 1/2 to 5 megohms...	N	.50
Tube Base, no electrical leakage.....	N	.75
Filament Rheostat, for panel mounting...	N	1.00
A. Battery Potentiometer.....	N	1.25
Vernier Variometer, for panel mounting...	N	1.50
Formica Panel, 10x10x 1/8".....	—	3.25
Ampliformer, Unmounted.....	N	3.75
Variometer for panel mounting.....	O	6.10
Vario-Coupler for panel mounting.....	O	6.90

Send 10c in stamps for complete catalog describing our 85 items



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